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(54) **GYPSUM MOULD, METHOD FOR MAKING THE SAME AND POROUS DRYING STRUCTURE FOR USE IN SAID MOULD**

(57) A gypsum mould (500) for the fabrication of an item is described, the mould (500) comprising a porous drying structure (505) comprising a set inorganic material - such as gypsum, a carbonate or an oxide - and a moulding structure (510) comprising gypsum, wherein the porous drying structure (505) is at least partially enclosed within the moulding structure (510). The gypsum mould may be more easily recycled at the end of its lifetime. A method of making such a gypsum mould (500) and a porous drying structure (505) are also claimed.

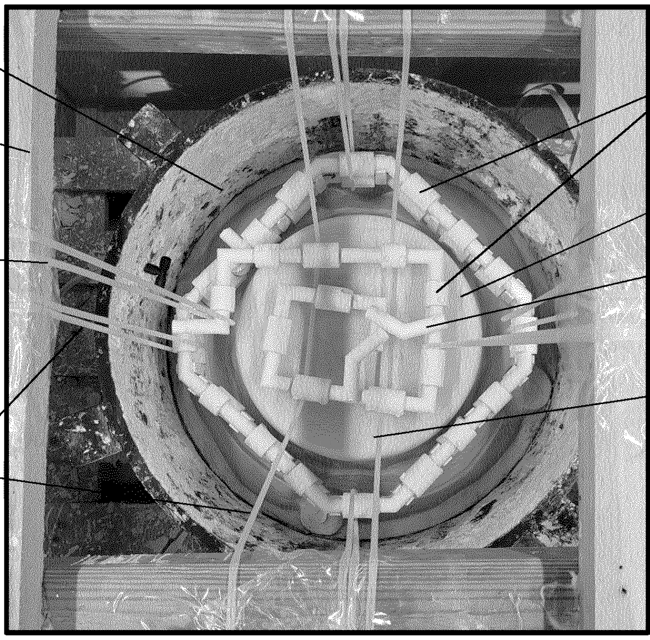


FIG. 18

Processed by Luminess, 75001 PARIS (FR)

Description

FIELD OF THE DISCLOSURE

[0001] The present disclosure generally relates to a mould for manufacturing an item. More specifically, the present disclosure relates to a mould comprising a support structure and a moulding structure. The present disclosure also relates to a method of making the mould.

BACKGROUND TO THE INVENTION

[0002] In industry, forming objects in moulding processes is often necessary. For example, ceramic items are often cast or moulded in reusable moulds as part of routine manufacturing processes. Often, these items have complex shapes.

[0003] Construction of the often complex moulds required for these processes is complicated. These complex moulds are especially prevalent where pressure or a pressing stage is used during the moulding process. A typical mould structure may include plastic tubes held in place by a metallic wire structure, with this internal structure then surrounded by gypsum. In this way, the plastic and metal structure provides a basis around which the gypsum can be added, and the gypsum material itself is crafted to form the external shape of the mould. In some cases, the plastic tubes transport air through the mould while the gypsum is set to achieve optimum porosity.

[0004] Additionally, during the slip casing of ceramic items, the porous plaster mould will absorb water from the ceramic slip precursor being moulded. Where a mould is used during a pressing process with a ceramic clay, the mould will act as a permeable structure for water from the ceramic clay. In either case, when drying the mould after the ceramic green body is produced it is known to pass compressed air through the plastic tubes to dry the mould more rapidly. In this way, the time interval before the mould may be reused is reduced.

[0005] Such moulds work well in use but are challenging to construct and recycle. Highly skilled individuals must create these moulds at great expense in a time-consuming process. Any recycling process necessitates separating the plastic, metal and gypsum components, a task undertaken manually. This manual separation is time-consuming and dangerous.

[0006] Aspects of the present disclosure seek to alleviate these problems with prior known systems.

SUMMARY OF THE INVENTION

[0007] According to a first aspect of the present invention, there is provided a mould for the fabrication of an item, the mould comprising a porous drying structure, the porous drying structure comprising a set inorganic material; and a moulding structure comprising gypsum wherein the porous drying structure is at least partially enclosed within the moulding structure.

[0008] In this way, there is provided a mould that may be more easily recycled. As the porous drying structure comprises a set inorganic material, the mould can be recycled using generic bulk processes, with the porous drying structure forming an impurity within the recycled moulding structure.

[0009] Gypsum is calcium sulphate dihydrate ($CaSO_4.2H_2O$). Preferably, the moulding structure is a gypsum composition. Preferably, a gypsum composition comprises at least 50 wt.% gypsum. More preferably, a gypsum composition comprises at least 60 wt.% gypsum. Still more preferably, a gypsum composition comprises at least 70 wt.% gypsum. Yet more preferably, a gypsum composition comprises at least 80 wt.% gypsum. Even more preferably, a gypsum composition comprises at least 90 wt.% gypsum. Most preferably, a gypsum composition comprises at least 95 wt.% gypsum. A gypsum composition may comprise additives/impurities in the form of any one or more of calcium carbonates, magnesium carbonates, clay, dolomites or silicates.

[0010] Preferably, at least 90% of the porous drying structure by volume is enclosed within the moulding structure. More preferably, at least 97% of the porous drying structure by volume is enclosed within the moulding structure. Still more preferably, at least 99% of the porous drying structure by volume is enclosed within the moulding structure. Most preferably, the porous drying structure is entirely enclosed within the moulding structure. Where the porous drying structure is entirely enclosed within the moulding structure, none of the porous drying structure is visible to a user. Additionally, the moulding structure forms the entire exterior surface of the mould.

[0011] Preferably, the moulding structure comprises at least one moulding surface. In use, the moulding surface shapes the item to be moulded. Preferably, the porous drying structure does not intersect the moulding surface. Preferably, the porous drying structure does not interrupt the moulding surface. Preferably, the porous drying structure does not disrupt the moulding surface.

[0012] Preferably, the porous drying structure comprises a continuous cavity. Preferably, the continuous cavity comprises a tube. More preferably, the continuous cavity comprises a plurality of interconnected tubes. Where the porous drying structure comprises a continuous cavity, this may allow air, preferably compressed air, or another fluid or gas to be passed through the cavity and the porous drying structure. This ability to pass air through the porous drying structure may allow the porosity of the moulding structure to be optimized during the manufacturing process, and to increase the speed of water can be removed from the mould reducing the interval required between successive moulding processes. Air may be moved through the continuous cavity via a vacuum or via a positive pressure. Preferably, the continuous cavity is a continuous central cavity.

[0013] Preferably the central cavity has a diameter in the range of 2 mm to 10 mm inclusive. More preferably, the central cavity has a diameter of 5 mm. Preferably the porous drying structure has a wall thickness of at least 2 mm.

[0014] Preferably, the porous drying structure consists of a set inorganic material. As the porous drying structure consists of a set inorganic material, the mould can be more easily recycled using generic bulk processes, with the porous drying structure forming an impurity within the recycled moulding structure. It is understood that a set material is one which has been set, for example a liquid slurry that has set into a solid form.

[0015] Preferably, for the porous drying structure, the set inorganic material is selected from the list consisting of gypsum, a carbonate or an oxide. For example, the set inorganic material may be calcium carbonate, silicon oxide, alumina oxide or titanium oxide. Most preferably, for the porous drying structure, the set inorganic material comprises gypsum.

[0016] Preferably, the porous drying structure comprises a gypsum composition. More preferably, the porous drying structure consists of a gypsum composition.

[0017] Preferably, the mould further comprises a support structure connected to the porous drying structure, wherein the support structure is at least partially enclosed within the moulding structure. The use of a support structure may be advantageous in supporting the porous drying structure during the manufacture of the mould, allowing the porous drying structure to have a very high porosity.

[0018] In some embodiments, the support structure comprises at least one cylinder, at least one cube, at least one block, or at least one U-shape. Preferably, the support structure comprises at least one tetrapod. More preferably, the support structure comprises a plurality of stacked tetrapods. Preferably, the support structure comprises at least one cone. More preferably, the support structure comprises a plurality of stacked cones. Preferably, the support structure comprises at least one brick. More preferably, the support structure comprises a plurality of stacked bricks. More preferably, the support structure support and/or position adjacent elements of the porous drying structure in position relative to one another. Still more preferably, at least one end of the support structure is shaped to accommodate the porous drying structure. Most preferably, the support structure has two or more portions shaped to accommodate the porous drying structure.

[0019] Each component discussed above can be used in combination with the others. As such, a support structure may comprise any combination of cylinders, cubes, blocks, U-shapes, tetrapods, cones and/or bricks.

[0020] Preferably, the support structure comprises a plurality of support components. In some embodiments, each of the plurality of support components comprises at least one tapered portion. More preferably, the tapered portions have a 1 degree taper.

[0021] Preferably, at least 90% of the support structure by volume is enclosed within the moulding structure. More preferably, at least 97% of the support structure by volume is enclosed within the moulding structure. Still more preferably, at least 99% of the support structure by volume is enclosed within the moulding structure. Most preferably, the entire support structure is enclosed within the moulding structure. Where the support structure is entirely enclosed within the moulding structure, none of the support structure is visible to a user. Additionally, the moulding structure forms the entire exterior surface of the mould.

[0022] Preferably, the support structure does not intersect the moulding surface. Preferably, the support structure does not interrupt the moulding surface. Preferably, the support structure does not disrupt the moulding surface.

[0023] Preferably, the support structure comprises a set inorganic material. More preferably, the support structure consists of a set inorganic material. As the support structure comprises or consists of a set inorganic material, the mould can be more easily recycled using generic bulk processes, with the support structure forming an impurity within the recycled moulding structure.

[0024] Preferably, for the support structure, the set inorganic material is selected from the list consisting of gypsum, a carbonate or an oxide. For example, the set inorganic material may be calcium carbonate, silicon oxide, alumina oxide or titanium oxide. Most preferably, for the support structure, the set inorganic material comprises gypsum.

[0025] Preferably, the support structure comprises a gypsum composition. More preferably, the support structure consists of a gypsum composition.

[0026] Preferably, the support structure is substantially free or free of metallic components. Preferably, the moulding structure is substantially free or free of metallic components. Preferably, the porous drying structure is substantially free or free of metallic components. More preferably, the moulding structure and the porous drying structure are substantially free or free of metallic components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of metallic components. Here, metallic components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0027] Preferably, the support structure is substantially free or free of plastic components. Preferably, the moulding structure is substantially free or free of plastic components. Preferably, the porous drying structure is substantially free or free of plastic components. More preferably, the moulding structure and the porous drying structure are substantially free or free of plastic components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of plastic components. Here, plastic components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0028] Preferably, the support structure is substantially free or free of textile components. Preferably, the moulding structure is substantially free or free of textile components. Preferably, the porous drying structure is substantially free or free of textile components. More preferably, the moulding structure and the porous drying structure are substantially free or free of textile components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of textile components. Here, textile components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0029] Preferably, the support structure is substantially free or free of fibreglass components. Preferably, the moulding structure is substantially free or free of fibreglass components. Preferably, the porous drying structure is substantially free or free of fibreglass components. More preferably, the moulding structure and the porous drying structure are substantially free or free of fibreglass components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of fibreglass components. Here, fibreglass components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0030] Preferably, the porous drying structure has a porosity in the range of 22% to 58% inclusive. More preferably, the porous drying structure has a porosity in the range of 45% to 55% inclusive. Preferably, the moulding structure has a porosity in the range of 15% to 60% inclusive. Preferably the support structure has a porosity in the range of 22% to 58% inclusive.

[0031] Herein, the porosity of a solid is taken as its pore volume. The pore volume of a solid is measured by calculating the percentage increase in weight observed when a test piece is saturated with a fluid, most usually water, compared to the dry weight of the test piece. Pore volume testing is described in further detail below.

[0032] Preferably, the porous drying structure has a greater porosity than the moulding structure. Preferably the porous drying structure has a greater porosity than the support structure. Preferably, the moulding structure has a greater porosity than the support structure. More preferably, the porous drying structure has a greater porosity than the moulding structure that in turn has a greater porosity than the support structure.

[0033] The porous drying structure permits fluid, such as air, to pass through its structure. By passing air through the porous drying structure, the porosity of the moulding structure may be increased during the manufacturing process. As such, there is benefit in the porous drying structure having a greater porosity than the moulding structure to prevent pressure leaks in the weakest section of the moulding structure.

[0034] The moulding structure may absorb the water from the ceramic paste used to form the object to be cast during the shaping and pressing process. As such, the porosity of the moulding structure may be dependent on the moisture of ceramic paste, the design of the mould and speed of press.

[0035] Preferably, the moulding structure, porous drying structure and support structure comprise materials with similar properties. If each component of the mould has similar properties, this increases the ease with which the mould as a whole may be recycled.

[0036] Preferably, the support structure is physically connected to the moulding structure. Preferably, the porous drying structure is physically connected to the moulding structure. Preferably, the porous drying structure is physically connected to the support structure.

[0037] Preferably, the porous drying structure comprises at least one ballast member. More preferably, the porous drying structure comprises a plurality of ballast members.

[0038] According to a second aspect of the present invention, there is provided a porous drying structure for use in the mould as hereinbefore described.

[0039] In this way a porous drying structure that can be used in a mould to realise the hereinbefore described advantages is provided. Optionally, the porous drying structure is self-supporting.

[0040] In some embodiments, the support structure comprises a plurality of elongate members. Preferably, the elongate members are flexible. Preferably, the elongate members comprise elongate tubes. More preferably, the elongate members consist of elongate tubes. Preferably, the elongate members comprise a plastic, silicone or rubber material. More preferably, the elongate members consist of a plastic, silicone or rubber material. Still more preferably, the elongate member is chemically inert. It may be advantageous for the elongate member to be chemically inert to ensure it does not react during the process of mould manufacture, so may be easily removed from the mould. In a preferred embodiment, each elongate member within the plurality of elongate members comprises a flexible silicone tube.

[0041] Preferably, where the support structure comprises a plurality of elongate members, at least one elongate member supports one region of the porous drying structure. Preferably, where the support structure comprises a plurality of elongate members, at least one elongate member supports a plurality of regions of the porous drying structure. More preferably, different elongate members within the plurality of elongate members support different numbers of regions of the porous drying structure.

[0042] In the embodiments described above, a flexible structure is configured to support the porous drying structure. Improved ease of positioning of the porous drying structure can be achieved by manipulating and adjusting each tube of the plurality of elongate tubes. Further, better accuracy of positioning of the porous drying structure can be achieved by providing an easily adjustable support structure.

[0043] In embodiments wherein the support structure comprises a plurality of elongate members, preferably, the mould comprises a scaffolding and the plurality of elongate members are configured to be attached to the scaffolding. In this way, the plurality of elongate members may be suspended from the scaffolding.

[0044] Preferably, the mould comprises a housing. More preferably, the housing comprises a mother mould or case mould.. In this way, exterior moulding walls are formed in the desired shape for the moulding of the moulding structure. Preferably, the scaffolding is configured to be located on the housing. More preferably, the scaffolding is configured to be located on an upper surface of the housing. Preferably, the mould comprises at least one height adjustment block configured to be located between the scaffolding and the housing. In this way, the height of the scaffolding, and consequently the height of the suspended plurality of elongate members can be adjusted relative to the housing.

[0045] According to a third aspect of the present invention, there is provided a method of forming a mould, the method comprising forming a porous drying structure comprising a set inorganic material, pouring a settable slurry such that the settable slurry at least partially encloses the porous drying structure, and drying the settable slurry to form a moulding structure comprising gypsum.

[0046] In this way, there is provided a method of manufacturing a mould that may be more easily recycled. As the porous drying structure comprises a set inorganic material, the mould can be recycled using generic bulk processes, with the porous drying structure forming an impurity within the recycled moulding structure.

[0047] Preferably, the method further comprises positioning the porous drying structure within the housing. Preferably, positioning is such that the porous drying structure rests on a base moulding surface of the housing. Preferably, positioning is such that the porous drying structure rests upon an exterior surface the case mould. Preferably, the method further comprises positioning the support structure between the housing and the porous drying structure. Preferably, the method further comprises securing the support structure to the scaffolding. Preferably, the method further comprises raising the support structure by raising the scaffolding. Preferably, the method further comprises adjusting the position of the support structure by adjusting the position scaffolding.

[0048] Such method steps are particularly advantageous wherein the support structure comprises a plurality of elongate members, such as silicone tubes.

[0049] Herein, a settable slurry is considered to be slurry that, when set, forms a solid comprising gypsum. Preferably, the settable slurry comprises calcium sulphate hemihydrate ($CaSO_4 1/2H_2O$) and water in a ratio of between 1.2:1 and 3.5:1.

[0050] Gypsum is calcium sulphate dihydrate ($CaSO_4.2H_2O$). Preferably, the moulding structure is a gypsum composition. Preferably, a gypsum composition comprises at least 50 wt.% gypsum. More preferably, a gypsum composition comprises at least 60 wt.% gypsum. Still more preferably, a gypsum composition comprises at least 70 wt.% gypsum. Yet more preferably, a gypsum composition comprises at least 80 wt.% gypsum. Even more preferably, a gypsum composition comprises at least 90 wt.% gypsum. Most preferably, a gypsum composition comprises at least 95 wt.% gypsum. A gypsum composition may comprise additives/impurities in the form of any one or more of calcium carbonates, magnesium carbonates, dolomites or silicates.

[0051] Preferably, the settable slurry is poured such that at least 90% of the porous drying structure by volume is enclosed within the settable slurry. More preferably, the settable slurry is poured such that at least 97% of the porous drying structure by volume is enclosed within the settable slurry. Still more preferably, the settable slurry is poured such that at least 99% of the porous drying structure by volume is enclosed within the settable slurry. Most preferably, the settable slurry is poured such that the porous drying structure is entirely enclosed within the settable slurry. Where the porous drying structure is entirely enclosed within the settable slurry, none of the porous drying structure is visible to a user. Additionally, the settable slurry dries to form the entire exterior surface of the mould.

[0052] Preferably, the moulding structure comprises at least one moulding surface. In use, the moulding surface shapes the item to be moulded. Preferably, the porous drying structure does not intersect the moulding surface. Preferably, the porous drying structure does not interrupt the moulding surface. Preferably, the porous drying structure does not disrupt the moulding surface.

[0053] Preferably, the step of forming the porous drying structure comprises forming the porous drying structure with a continuous cavity. Preferably, the continuous cavity may comprise a tube. More preferably, the continuous cavity may comprise a plurality of interconnected tubes. Where the porous drying structure comprises a continuous cavity, this may allow air, preferably compressed air, or another fluid or gas to be passed through the cavity and the porous drying structure. This ability to pass air through the porous drying structure may allow the porosity of the moulding structure to be increased during the manufacturing process, and to increase the speed of water can be removed from the mould reducing the interval required between successive moulding processes. Air may be moved through the continuous cavity via a vacuum or via a positive pressure. Preferably, the continuous cavity is a continuous central cavity.

[0054] Preferably the central cavity has a diameter in the range of 2 mm to 10 mm inclusive. More preferably, the central cavity has a diameter of 5 mm. Preferably the porous drying structure has a wall thickness of at least 2 mm.

[0055] Preferably, the porous drying structure consists of a set inorganic material. Preferably, for the porous drying structure, the set inorganic material is selected from the list consisting of gypsum, a carbonate or an oxide. For example, the set inorganic material may be calcium carbonate, silicon oxide, alumina oxide or titanium oxide. Most preferably, for the porous drying structure, the set inorganic material comprises gypsum.

[0056] Preferably, the porous drying structure comprises a gypsum composition. More preferably, the porous drying structure consists of a gypsum composition.

[0057] Preferably, the method further comprises forming a support structure connected to the porous drying structure, wherein the support structure holds the porous drying structure in position during the steps of pouring and drying the settable slurry. The use of a support structure may be advantageous in supporting the porous drying structure during the manufacture of the mould, allowing the porous drying structure to have a very high porosity.

[0058] In some embodiments, the support structure comprises at least one cylinder, cube, block, or U-shape. Preferably, the support structure comprises at least one tetrapod. More preferably, the support structure comprises a plurality of stacked tetrapods. Preferably, the support structure comprises at least one cone. More preferably, the support structure comprises a plurality of stacked cones. Preferably, the support structure comprises at least one brick. More preferably, the support structure comprises a plurality of stacked bricks. More preferably, the support structure support and/or position adjacent elements of the porous drying structure in position relative to one another. Still more preferably, at least one end of the support structure is shaped to accommodate the porous drying structure. Most preferably, the support structure has two or more portions shaped to accommodate the porous drying structure.

[0059] Each component discussed above can be used in combination with the others. As such, a support structure may comprise any combination of cylinders, cubes, blocks, U-shapes, tetrapods, cones and/or bricks.

[0060] Preferably, the step of forming the support structure comprises connecting a plurality of support components. More preferably, the step of connecting the plurality of support components comprises abrading the surface of at least one support component, then inserting the abraded surface into a second support component to form an interference fit. Preferably the step of connecting the plurality of support components comprises connecting at least two components using a calcium sulphate paste. More preferably, the calcium sulphate paste has a solid to water ratio less than or equal to 1:1. Preferably, the plurality of support components comprise tapered portions that allow the support components to be inserted into one another and held in position via an interference fit. More preferably, the tapered portions have a 1 degree taper.

[0061] Preferably, at least 90% of the support structure by volume is enclosed within the moulding structure. More preferably, at least 97% of the support structure by volume is enclosed within the moulding structure. Still more preferably, at least 99% of the support structure by volume is enclosed within the moulding structure. Most preferably, the support structure is entirely enclosed within the moulding structure. Where the support structure is entirely enclosed within the moulding structure, none of the support structure is visible to a user. Additionally, the moulding structure forms the entire exterior surface of the mould.

[0062] Preferably, the support structure does not intersect the moulding surface. Preferably, the support structure does not interrupt the moulding surface. Preferably, the support structure does not disrupt the moulding surface.

[0063] Preferably, the support structure comprises a set inorganic material. More preferably, the support structure consists of a set inorganic material. As the support structure comprises or consists of a set inorganic material, the mould can be more easily recycled using generic bulk processes, with the support structure forming an impurity within the recycled moulding structure.

[0064] Preferably, for the support structure, the set inorganic material is selected from the list consisting of gypsum, a carbonate or an oxide. For example, the set inorganic material may be calcium carbonate, silicon oxide, alumina oxide or titanium oxide. Most preferably, for the support structure, the set inorganic material comprises gypsum.

[0065] Preferably, the support structure comprises a gypsum composition. More preferably, the support structure consists of a gypsum composition.

[0066] Preferably, the support structure is substantially free or free of metallic components. Preferably, the moulding structure is substantially free or free of metallic components. Preferably, the porous drying structure is substantially free or free of metallic components. More preferably, the moulding structure and the porous drying structure are substantially free or free of metallic components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of metallic components. Here, metallic components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0067] Preferably, the support structure is substantially free or free of plastic components. Preferably, the moulding structure is substantially free or free of plastic components. Preferably, the porous drying structure is substantially free or free of plastic components. More preferably, the moulding structure and the porous drying structure are substantially free or free of plastic components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of plastic components. Here, plastic components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0068] Preferably, the support structure is substantially free or free of textile components. Preferably, the moulding structure is substantially free or free of textile components. Preferably, the porous drying structure is substantially free or free of textile components. More preferably, the moulding structure and the porous drying structure are substantially free or free of textile components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of textile components. Here, textile components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0069] Preferably, the support structure is substantially free or free of fibreglass components. Preferably, the moulding structure is substantially free or free of fibreglass components. Preferably, the porous drying structure is substantially free or free of fibreglass components. More preferably, the moulding structure and the porous drying structure are substantially free or free of fibreglass components. Most preferably, the moulding structure, the porous drying structure and the support structure are substantially free or free of fibreglass components. Here, fibreglass components should be interpreted as items deliberately incorporated into the mould rather than impurities.

[0070] Preferably, the method further comprises passing air through the porous drying structure during the step of setting the settable slurry to optimise the porosity of the moulding structure. More preferably, the step of optimising the porosity of the moulding structure comprises increasing the porosity of the moulding structure. Preferably, air is moved through the continuous cavity via a vacuum. Alternatively, air is moved through the continuous cavity via a positive pressure. Preferably, the air pressure in the porous drying structure during this step is in the range 50 kPa to 600 kPa inclusive.

[0071] Preferably, the porous drying structure has a greater porosity than the moulding structure. Preferably the porous drying structure has a greater porosity than the support structure. Preferably, the moulding structure has a greater porosity than the support structure. More preferably, the porous drying structure has a greater porosity than the moulding structure that in turn has a greater porosity than the support structure.

[0072] Preferably, the moulding structure, porous drying structure and support structure comprise materials with similar properties. If each component of the mould has similar properties, this increases the ease with which the mould as a whole may be recycled.

[0073] Preferably, the method comprises physically connecting the support structure to the moulding structure.

[0074] Preferably, the method comprises physically connecting the porous drying structure to the moulding structure.

[0075] Preferably, the method comprises physically connecting the porous drying structure to the support structure.

[0076] Preferably, the method comprises providing at least one ballast member connected to the porous drying structure. More preferably, the method comprises providing a plurality of ballast members connected to the porous drying structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0077] The disclosure will be further described with reference to examples depicted in the accompanying figures in which:

Figure 1 depicts an example of mould for the fabrication of an item, as known in the prior art;

Figure 2 depicts a second example of a mould for the fabrication of an item, as known in the prior art;

Figure 3 depicts a top view of a porous drying structure of a mould for the fabrication of an item according to a first aspect of the present invention;

Figure 4 depicts a perspective view of the porous drying structure of Figure 1;

Figure 5 depicts a perspective view of mould for the fabrication of an item comprising the porous drying structure of Figures 3 and 4;

Figure 6 depicts a bottom view of a further embodiment of a mould according to a first aspect of the present invention;

Figure 7 depicts an angled member of the porous drying structure of Figures 3 to 5;

Figure 8 depicts a schematic diagram of a method according to the third aspect of the invention;

Figure 9A depicts a top view of a second embodiment of a portion of a mould for the fabrication of an item according to a first aspect of the present invention, the housing and height adjustment blocks not shown;

Figure 9B depicts a side view of the embodiment of Figure 9A;

Figure 10 depicts the mould for the fabrication of an item of Figures 9A and 9B, including the housing and height adjustment blocks;

Figure 11 depicts placement of the porous drying structure within the housing prior to positioning of the plurality of elongate tubes in the mould of Figure 10;

Figure 12 depicts positioning of the plurality of elongate tubes in the mould of Figure 10;

Figure 13 depicts suspension of the porous drying structure and plurality of elongate tubes in the mould of Figure 10;

Figure 14 depicts placement of the height adjustment blocks in the mould of Figure 10;

Figure 15 depicts pouring of the settable slurry into the mould of Figure 10;

Figure 16 depicts removal of the plurality of silicone tubes from the mould of Figure 10 upon setting of the settable slurry;

Figure 17 depicts the mould of Figure 10 after removal of the plurality of silicone tubes;

Figure 18 depicts a top view of the mould of Figure 10, prior to pouring of the settable slurry;

Figure 19 depicts a top view of the mould of Figure 10, after pouring of the settable slurry;

Figure 20 depicts a bottom view of a mould according to the first aspect of the present invention, wherein the plurality of silicone tubes have been removed from the mould; and

Figure 21 depicts a schematic diagram of a second embodiment of a method according to the third aspect of the invention.

DETAILED DESCRIPTION

[0078] The following description presents particular examples and, together with the drawings, serves to explain principles of the disclosure. However, the scope of the invention is not intended to be limited to the precise details of the examples, since variations will be apparent to a skilled person and are deemed to be covered by the description. Terms for components used herein should be given a broad interpretation that also encompasses equivalent functions and features. In some cases, alternative terms for structural features may be provided but such terms are not intended to be exhaustive.

[0079] Descriptive terms should also be given the broadest possible interpretation; e.g. the term "comprising" as used in this specification means "consisting at least in part of" such that interpreting each statement in this specification that includes the term "comprising", features other than that or those prefaced by the term may also be present. Related terms such as "comprise" and "comprises" are to be interpreted in the same manner.

[0080] The description herein refers to examples with particular combinations of features, however, it is envisaged that further combinations and cross-combinations of compatible features between embodiments will be possible. Indeed, isolated features may function independently as an invention from other features and not necessarily require implementation as a complete combination.

[0081] Figures 1 and 2 illustrate examples of moulds for the fabrication of an item which are known in the art. The moulding structure of the moulds of Figures 1 and 2 is not illustrated to better show the inner composition of the mould.

[0082] Figure 1 depicts a mould 100 comprising a metal structure 105 and a plastic elongate tube 110. The metal structure 105 comprises a metallic wire grid comprising a plurality of parallel and perpendicular metal rods. The metal structure 105 is substantially cross-shaped or plus-shaped, with the edges 115 of the cross folded up to form a three-dimensional bowl structure.

[0083] The elongate tube 110 is fixed to the metal structure 105 such that a first end 110a of the tube is located adjacent the centre of the grid of the metal structure 105 and a second end 110b may project outside of the perimeter of the metal structure 105. The elongate tube 110 is wound to form a spiral shape. The elongate tube 110 is wound such that the first end 110a is located at the base of the three-dimensional bowl structure defined by the curved edges of the metal structure 105, and the elongate tube 110 is fixed to the folded edges 115 of the metal structure 105 as the diameter of the spiral increases towards the second end 110b.

[0084] Similarly, Figure 2 depicts a second example of a mould 200 comprising a metal structure 205 and a plastic elongate tube 210. In this example, the metal structure 205 comprises a metallic wire mesh formed from twisted metal wire comprising hexagonal openings. No folded edges are present, and instead the metal structure 205 is deformed to provide a three-dimensional bowl structure wherein all surfaces of the structure comprise mesh.

[0085] As with the example of Figure 1, the plastic elongate tube 210 is fixed to the metal structure 205 at a plurality of locations and the elongate tube 210 is wound about the metal structure 205 to form a spiral shape. In this embodiment, a first end 210a of the elongate tube 210 is located outside the perimeter of the metal structure 205.

[0086] Both examples of Figures 1 and 2 may be surrounded by a moulding structure, such as gypsum, to form the mould 100, 200. In this way, the plastic elongate tubes 110, 210 and metal structures 105, 205 provide a basis around which the gypsum can be added, and the gypsum material itself is crafted to form the external shape of the mould.

[0087] However, as the moulds 100, 200 of the prior art comprise gypsum, metal and plastic, it is challenging to assemble the moulds 100, 200 and also challenging to recycle the materials of the moulds 100, 200 at the end of use.

[0088] These problems with the prior art are overcome by the present invention.

[0089] According to a first aspect of the present invention, there is provided a mould 300 for the fabrication of an item, the mould 300 comprising a porous drying structure 305. The porous drying structure 305 comprises a set inorganic material, such as a gypsum composition.

[0090] The porous drying structure 305 comprises a plurality of interconnected tubes 320 such that a continuous cavity 325 projects through the porous drying structure 305. The cavity 325 is located centrally within each tube 320 and has a substantially cylindrical cross-section. In this embodiment, the diameter of the cavity 325 is 5 mm. Air, preferably compressed air can be passed through the cavity 325 and into the pores of the porous drying structure 305. As the inner walls of the porous drying structure 305 defining the cavity 325 are porous, a fluid pathway is created from the cavity into the porous drying structure 305.

[0091] The plurality of interconnected tubes 320 comprises a plurality of cylindrical straight members 330 and a plurality of generally cylindrical angled members 335. The outer diameter of the plurality of straight members 330 is greater than the outer diameter of the plurality of angled members 335 to improve strength of the porous drying structure 305. The plurality of angled members 335 comprise a plurality of first angled members 335a comprising a central bend with an angle β of 135 degrees and a plurality of second angled members 335b comprising a central bend with an angle β of 90 degrees, as illustrated in Figure 7.

[0092] A first end 355 of an angled member 335 of the plurality of angled members 335 is configured to be housed within the cavity 325 of a straight member 330 of the plurality of straight members 330 with an interference fit. Similarly, a second end 360 of an angled member 335 is configured to be housed within the cavity 325 of a straight member 330 with an interference fit. In this way, the plurality of straight members 330 and plurality of angled members 335 interlock to form a secure connection which reduces the fluid escaping the cavity 325 between each straight member 330 and angled member 335. The first end 355 and second end 360 may be manufactured by removing material from the outer surface of each end 355, 360 to permit an interference fit between the angled member 335 and the straight members 330.

[0093] The plurality of straight members 330 and plurality of angled members 335 are connected such that a straight member 330 is connected to an angled member 335 on both sides and an angled member 335 is connected to a straight member on both sides, such that pattern of the interconnected tubes 320 is sequential. In this way, the cavity 325 is continuous through the porous drying structure 305.

[0094] The interconnected tubes 320 may be manufactured using additive manufacturing techniques, such as three-dimensional (3D) printing, or by moulding.

[0095] The mould 300 further comprises a moulding structure 310 comprising a gypsum composition, as illustrated in Figures 5 and 6. The moulding structure 310 is cylindrical and comprises a cylindrical central protrusion 315. The porous drying structure 305 is at least partially enclosed within the moulding structure 310. As illustrated in Figure 6, at least 97% of the porous drying structure 305 by volume is enclosed within the moulding structure 310. It is envisaged that the porous drying structure 305 may be entirely enclosed within the moulding structure 310.

[0096] The moulding structure 310 comprises at least one moulding surface (not pictured) configured to shape the item to be moulded. The at least one moulding surface comprises the internal surfaces of the moulding structure 310, such that a mould cavity (not pictured) is formed within the moulding structure 310, the mould cavity defined by the at least one moulding surface. The porous drying structure 305 does not intersect, interrupt or otherwise disrupt the moulding surface, such that the porous drying structure 305 does not influence the shape of the mould cavity.

[0097] A first end 305a of the drying structure is located adjacent the base surface 345 of the moulding structure 310, as illustrated in Figure 6. A second end 305b of the drying structure is located outside the outer perimeter of the top surface 350 of the moulding structure 310. In this way, the second end 305b can be connected to a fluid source, such as an air source configured to pump air into the cavity 325. The cavity 325 is continuous from the first end 305a to the second end 305b of the porous drying structure 305.

[0098] The porous drying structure 305 is spiral in shape, with approximately three turns between the first end 305a and the second end 205b. The plurality of angled members 335 permit the porous drying structure 305 to be positioned in a spiral shape, without deformation of the interconnected tubes 320.

[0099] The mould 300 further comprises a support structure 340 connected to the porous drying structure 305. The support structure 340 is partially enclosed within the moulding structure 310. The support structure 340 comprises a plurality of blocks 365 located between adjacent turns of the spiral shape of the porous drying structure 305. Each block 365 is connected to a first angled member 335a and a second angled member 335a. In this way, the support structure 340 connects angled members 335a to angled members 335a in adjacent turns of the spiral. The support structure 340 therefore improves stability and strength of the mould 300.

[0100] Each block 365 is configured to partially encase a portion of the corresponding angled member 335a with an interference fit such that the angled member 335a is connected to the block 365 and inhibited from moving in at least a first plane. Further, friction between the surfaces of the block 365 and the angled member 335a improve the strength of the connection between the block 365 and the angled member 335a. Optionally, calcium sulphate paste may be applied to the block 365 and angled member 335a to improve the connection.

[0101] The support structure 340 comprises a set inorganic material to improve ease of recycling using generic bulk processes. The moulding structure 310, porous drying structure 305 and support structure 340 comprise materials with similar properties and so the mould 300 is easy to recycle when decommissioned. Namely, the mould 300 can be recycled using generic bulk processes, with the porous drying structure 305 forming an impurity within the recycled moulding structure 310.

[0102] With reference to Figure 8, a method 400 according to a third aspect of the invention is disclosed. The method 400 is a method of forming a mould 300. The method 400 comprises forming 401 a porous drying structure 305 comprising a set inorganic material. The method 400 further comprises pouring 402 a settable slurry such that the settable slurry at least partially encloses the porous drying structure 305. The method 400 further comprises drying 403 the settable slurry to form a moulding structure 310 comprising gypsum.

[0103] Air, preferably compressed air can be passed through the cavity 325 and subsequently through the pores of the porous drying structure 305. In this way, air penetrates the porous drying structure 305 improving the ease and speed of drying of the porous drying structure 305. Water and other fluid can be driven out of the porous drying structure 305 by the air entering the cavity 325 and the pores of the porous drying structure 305.

[0104] The ability to pass air through the porous drying structure 305 allows the porosity of the moulding structure 310 to be optimized during the manufacturing process, thereby increasing the speed which water can be removed from the mould 300. As such, the interval required between successive moulding processes may be reduced.

The Measurement of Pore Volume

[0105] Herein the porosity of the given components of the mould was measured using a pore volume method. Here, the porosity of samples of each component were tested, these prismatic samples having dimensions of 20 mm by 20 mm by 160 mm. Each sample was cast and dried to a constant weight in a drying cabinet at 40°C. After a constant weight had been achieved, the samples were cooled to room temperature and weighed once more.

[0106] Next, each sample was placed in a water-filled desiccator and a vacuum was generated. The samples were left in water and under vacuum for 24 hours before they were removed and the surface of each object dried with a towel. Each sample was then immediately weighted.

[0107] After weighting, the pore volume was calculated via the following formula.

$$Pore\ Volume\ (PV) = \frac{\frac{S_R(m_1 - m_0)}{m_0}}{S_W}$$

Wherein:

$$Pore\ Volume\ \%\ (PV) = \frac{m_1 - m_0}{V} \times 100$$

m_1 = weight of sample after water exposure (grams)
m_0 = dry weight of sample (grams)
S_R = bulking density (grams/cm^3)
S_W = density of water (grams/cm^3)
V = volume of the sample (cm^3)

[0108] With reference to Figures 9A to 19, a second embodiment of a mould 500 for the fabrication of an item according to the first aspect of the present invention is depicted. The mould 500 comprising a porous drying structure 505. The porous drying structure 505 comprises a set inorganic material, such as a gypsum composition, and is substantially identical to the porous drying structure 305 of the first embodiment.

[0109] The mould 500 further comprises a cylindrical housing 580 comprising a gypsum composition, as illustrated in Figures 10 to 19. The porous drying structure 505 is entirely enclosed within the housing 580.

[0110] The housing 580 comprises a wall moulding surface 545a and a base moulding surface 545b configured to shape the item to be moulded. The moulding surfaces 545a, 545b comprise the internal surfaces of the housing 580, such that a mould is formed within the housing 580. The porous drying structure 505 does not intersect, interrupt or otherwise disrupt the moulding surface, such that the porous drying structure 505 does not influence the shape of the mould cavity.

[0111] A first end 505a of the drying structure 505 is located adjacent the base moulding surface 545b of the housing 580, as illustrated in Figure 18. A second end 505b of the drying structure 505 is located outside the outer perimeter of a top surface 550 of the housing 580. In this way, the second end 505b can be connected to a fluid source, such as an air source configured to pump air into the continuous cavity of the drying structure 505.

[0112] The housing 580 further comprises a mother mould or case mould 515 configured to form part of the base moulding surface 545b of the housing 580. The housing is arranged such that the wall moulding surface 545a projects above the height of the case mould 515. The case mould 515 comprises an exterior surface 515a which forms part of the base moulding surface 545b of the housing 580. In this way, a moulding structure 510 can be cast within the housing, the shape of the moulding structure 510 defined by the moulding surfaces 545a, 545b. The case mould 515 helps determine the shape of the bottom surface of the moulding structure 510 as it forms part of the base moulding surface 545b. The wall moulding surface 545a would determines the shape of the side surfaces of the moulding structure 510. The case mould 515 acts as an outer wall for the volume which the settable slurry is introduced to and reduces the volume which the settable slurry can fill within the housing 580.

[0113] The mould 500 further comprises a support structure 540 configured to be connected to the porous drying structure 505. The support structure 540 is partially enclosed within the housing 580. The support structure 540 comprises a plurality of silicone tubes 565. The plurality of silicone tubes 565 are flexible and can be positioned between the housing 580 and the porous drying structure 505, such that the support structure 540 provides a cradle for lifting the porous drying structure 505. The support structure 540 therefore improves the stability and strength of the mould 500, as the position of the porous drying structure 505 can be altered by adjusting the position of the support structure 540. The support structure is non-permanently connected to the porous drying structure 505, permitting additional adjustment of the position of the plurality of silicone tubes 565 relative to the porous drying structure 505.

[0114] The support structure 540 may comprise a lattice structure formed by the plurality of overlapping silicone tubes 565 positioned in a U-shape underneath the porous drying structure 505. In this way, the porous drying structure 505 is supported in an even manner across its length by the support structure 540. Alternatively, as depicted in Figure 18, the support structure may comprise a plurality of first silicone tubes 565' and/or a plurality of second silicone tubes 565".

[0115] The first silicone tubes 565' pass once underneath a single region of the porous drying structure 505, effectively cradling a single portion of the porous drying structure 505. In this way, support from the support structure 54 is targeted at regions of the porous drying structure 505 to be lifted from the housing 580. The second silicone tubes 565" pass once underneath the porous drying structure 505 however, unlike the first silicone tubes 565', the second silicone tubes 565" span at least two regions of the porous drying structure 505. In this way, each second silicone tubes 565" supports the weight of two regions of the porous drying structure 505, and lift both regions of the porous drying structure 505 away from the housing 580, thereby reducing the quantity of silicone tubes 565 required.

[0116] The mould 500 further comprises scaffolding 570. The plurality of silicone tubes 565 are configured to be attached and secured to the scaffolding 570. The scaffolding 570 may comprise a rigid framework such as a frame comprising a plurality of bars, blocks, poles or other suitable supports. The rigid framework may comprise any suitable material for supporting the weight of the support structure 540 and porous drying structure 505, such as wood or metal. As illustrated in Figure 9A, the scaffolding 570 of this embodiment comprises four elongate poles fixed together in a square frame. The plurality of silicone tubes 565 are configured to be secured to two of the four elongate poles of the scaffolding 570, allowing the plurality of silicone tubes 565 to be suspended from the scaffolding 570 when the scaffolding 570 is raised.

[0117] The mould further comprises at least one height adjustment block 575. The at least one height adjustment block 575 may comprise any suitable shim, wedge or other object suitable for raising the scaffolding 570 a predetermined height above the housing 580. The at least one height adjustment block 575 may comprise wood, cardboard or any other suitable material. Preferably, the at least one height adjustment block 575 comprises a pair of opposing, straight and parallel surfaces. The at least one block 575 is configured to sit on an upper surface 545c of the housing 580. In this embodiment, the at least one height adjustment block 575 comprises a plurality of height adjustment blocks, wherein the height of the scaffolding 570 from the housing 580 may be adjusted by removing a height adjustment block 575 from or adding a height adjustment block 575 to the upper surface.

[0118] The mould 500 may further comprise at least one elongate rigid member 585. The one or more elongate rigid members 585 may comprise gypsum poles made of waste tubes and connectors, or other recycled or non-recycled elongate objects. As outlined below, the porous drying structure 505 may float in the denser settable slurry 590 during manufacture, necessitating the need to manual hold the support structure 540 in place. As such, the user may use the at least one elongate rigid member 585 to apply a force to the porous drying structure 505, maintain the porous drying structure's 505 resting position against the base moulding surface 545b of the housing 580.

[0119] With reference to Figure 21, a second embodiment of a method 600 according to the third aspect of the invention is disclosed. The method 600 is a method of forming a mould 500. The method 600 comprises forming 601 a porous drying structure 505 comprising a set inorganic material. The method 600 further comprises and positioning the porous drying structure 505 within the housing 580 such that the porous drying structure 505 rests upon the base moulding surface 545b of the housing 580. Figure 11 illustrates the porous drying structure 505 placed on the base moulding surface 545b of the housing 580.

[0120] The method further comprises positioning 603 the support structure 540 between the housing 580 and the porous drying structure 505. In this way, the silicone tubes 565 of the support structure 540 are located underneath the porous drying structure 505 and are configured to support the porous drying structure 505. Positioning 603 is illustrated in Figures 12 and 18, wherein the silicone tubes 565 are located between the moulding surfaces 545a, 545b and the porous drying structure 505. The silicone tubes 565 are positioned such that the path traced by the portion of each silicone tube 565 located within the housing 580 comprises only a single bend. In this way, the portion of each silicone tube 565 located within the housing 580 is substantially U-shaped.

[0121] The method 600 further comprises securing 604 the support structure 540 to the scaffolding 570, such that the support structure 540 is fixed in a position wherein the support structure 540 does not contact the housing 580. Attaching and securing distal ends 565a of the silicone tubes 565 to the scaffolding 570 places the silicone tubes 565 under tension such that the porous drying structure 505 is not raised from its resting position within the housing 580 and remains in contact with the with housing 580, as illustrated in Figure 12.

[0122] The method 600 further comprises raising 605 the support structure 540 by raising the scaffolding 570. The support structure 540 is lifted away from the housing 580 such that the support structure 540 does not contact the housing 580 but the porous drying structure 505 remains in contact with base moulding surface 545b of the housing 580. As illustrated in Figure 13, the positioning 603 of the silicone tubes 565 is such that raising 604 the silicone tubes 565 away from the base moulding surface 545b also raises and suspends the porous drying structure 505 from the scaffolding and away from the base moulding surface 545b. In this way, the support structure 540 is less susceptible to breakage as stress and forces experienced during lifting are absorbed by the flexible silicone tubes 565, further reducing the risk of damage to the relatively rigid porous drying structure 505.

[0123] The method 600 further comprises adjusting 606 the position of the support structure 540 by adjusting the position scaffolding 570. Adjusting 606 may comprising positioning at least one height adjustment block 575 between the scaffolding 570 and the upper surface 545c of the housing 580 and/or removing at least one height adjustment block 575 between the scaffolding 570 and the upper surface 545c of the housing 580, as illustrated in Figure 14. In this way, the vertical and horizontal position of the support structure 540 can be modified by adjusting the position and/or height of the scaffolding 570 relative to the housing 580. In this embodiment, adjusting 606 comprises adjusting the position of the scaffolding 570 such that the distance between the scaffolding 570 and the upper surface 545c of the housing 580 is substantially constant at all locations of the scaffolding 570 and the scaffolding is level relative to the ground.

[0124] The method 600 further comprises pouring 607 a settable slurry 590 such that the settable slurry 590 entirely encloses the porous drying structure 505. The porous drying structure 505 may float in the denser settable slurry 590, necessitating the need to manual hold the support structure 540 in place. The user may then apply a force to the elongate rigid members 585 to ensure the porous drying structure 505 and support structure 540 remain in position while the settable slurry 590 sets.

[0125] The method 600 further comprises removing 608 the plurality of silicone tubes 565 from the settable slurry 590. Preferably, removing 608 the plurality of silicone tubes 565 from the settable slurry 590 occurs between 15 to 40 minutes after mixing and pouring the settable slurry 590 in step 607. In this way, before the settable slurry is fully dried to form a moulding structure 510, the silicone tubes 565 can be easily removed from the settable slurry 590 as they are not fixed to the porous drying structure 505. The external elements used to fix the porous drying structure 505 in place are no longer required and so are removed, such as for re-use or disposal. The moulding structure 510 is therefore free of any plastic, metal or other external element used during the manufacturing process. An example of removal of the silicone tubes 565 from the settable slurry 590 is depicted in Figures 16 and 17. The silicone tubes 540 can be untied, released or otherwise separated from the scaffolding 570, and the scaffolding 570 can be removed, as illustrated in Figure 16. The silicone tubes 540 can then be pulled, and removed, from the settable slurry 590 in direction Z via silicone tube holes 595 formed wherein the tubes projected from the surface of the settable slurry 590 prior to setting. Removal of the silicone tubes 540 is assisted by the lack of convoluted pathway the silicone tubes 540 form within the settable slurry 590. Channels within the set moulding structure 510 may remain, as illustrated in Figure 20, wherein the silicone tubes 540 were once present. In this way, the settable mould is free of plastic and can be recycled at the end of life. The silicone tubes 565 can be re-used in a subsequent iteration of the method 600 and/or recycled separately to the moulding structure 510.

[0126] The method 600 further comprises drying 609 the settable slurry 590 to form a moulding structure 510 comprising gypsum. The user may remove the force applied on the elongate rigid members 585 after adequate setting of the slurry has occurred, namely adequate setting may take around 15 minutes or may occur after a temperature increase of around 4 °C. Upon release of the elongate rigid members 585, the elongate rigid members 585 remain fixed in place within the partially set slurry and continue to prevent the porous drying structure 505 from rising to the surface.

[0127] Air, preferably compressed air can be passed through the cavity and subsequently through the pores of the porous drying structure 505. In this way, air penetrates the porous drying structure 505 improving the ease and speed of drying of the porous drying structure 505. Water and other fluid can be driven out of the porous drying structure 505 by the air entering the cavity 525 and the pores of the porous drying structure 505.

[0128] The ability to pass air through the porous drying structure 505 allows the porosity of the housing 580 to be optimized during the manufacturing process, thereby increasing the speed which water can be removed from the mould 500. As such, the interval required between successive moulding processes may be reduced.

[0129] The portion of the elongate rigid members 585 protruding from the moulding structure 510 may be cut such that they are flush with the exterior surface of the moulding structure 510. The U-shape of the silicone tubes 565 improve ease of removal of the silicone tubes 565 after the moulding structure 510 is set.

[0130] An upper exterior surface of the moulding structure 510 is depicted in Figure 20, wherein silicone tube holes 595 are illustrated after removal of the silicone tubes 540 from the settable slurry 590. Additionally, the rigid members 585 are illustrated protruding from the moulding structure 510 after cutting to be substantially flush with the exterior surface.

Claims

1. A mould for the fabrication of an item, the mould comprising;

   a porous drying structure, the porous drying structure comprising a set inorganic material; and
   a moulding structure comprising gypsum;
   wherein the porous drying structure is at least partially enclosed within the moulding structure.

2. The mould of claim 1, wherein at least 90% of the porous drying structure by volume is enclosed within the moulding structure.

3. The mould of claim 2, wherein the entire porous drying structure is enclosed within the moulding structure.

4. The mould of any one preceding claim, wherein the porous drying structure comprises a continuous cavity.

5. The mould of any one preceding claim, wherein the mould further comprises a support structure connected to the porous drying structure, wherein the support structure is at least partially enclosed within the moulding structure.

6. The mould of claim 5, wherein the support structure comprises a set inorganic material, and preferably consists of a set inorganic material.

7. The mould of claim 5, wherein the support structure comprises a plurality of elongate members, preferably wherein the elongate members are flexible.

8. The mould of any one of claims 5 to 7, wherein the entire support structure is enclosed within the moulding structure.

9. The mould of any one preceding claim, wherein the set inorganic material is selected from the list consisting of gypsum, a carbonate or an oxide.

10. A porous drying structure for use in the mould of any one preceding claim.

11. A method of forming a mould, the method comprising:

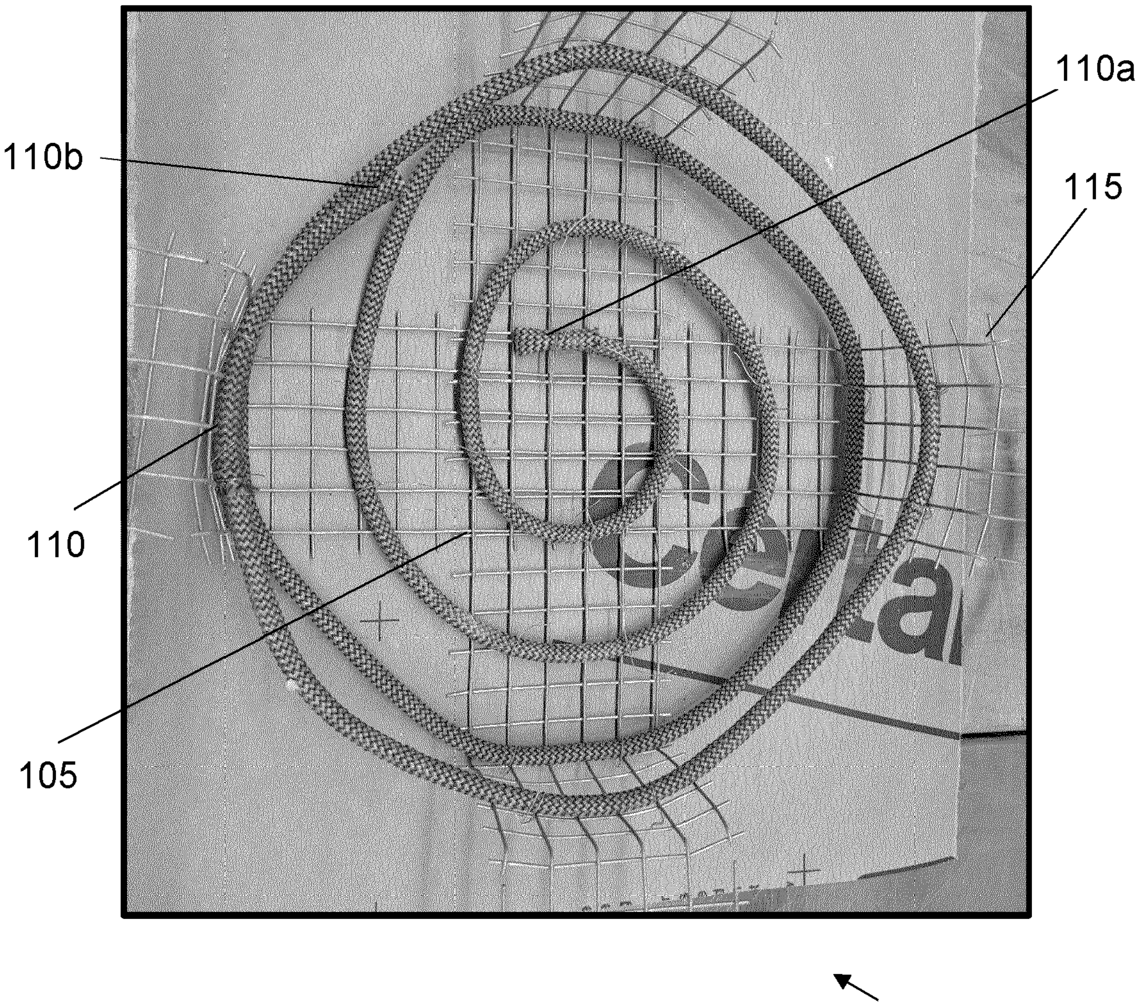
    forming a porous drying structure comprising a set inorganic material,
    pouring a settable slurry such that the settable slurry at least partially encloses the porous drying structure, and
    drying the settable slurry to form a moulding structure comprising gypsum.

12. The method of claim 11, wherein the settable slurry is poured such that at least 90% by volume of the porous drying structure is enclosed within the settable slurry.

13. The method of claim 11 or claim 12, wherein the method further comprises forming a support structure connected to the porous drying structure, wherein the support structure holds the porous drying structure in position during the steps of pouring and drying the settable slurry.

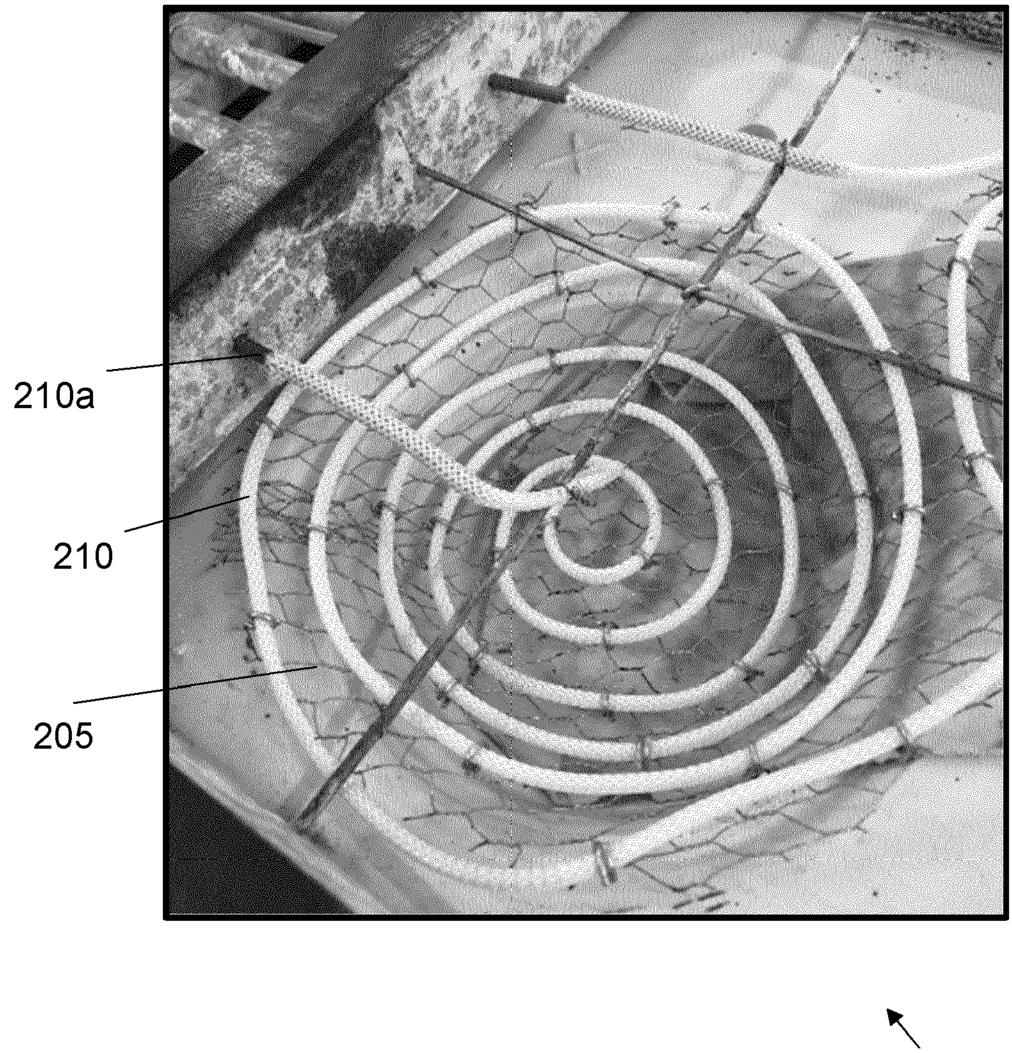
14. The method of claim 11 or claim 12, wherein the method further comprises passing air through the porous drying structure during the step of setting the settable slurry to optimise the porosity of the moulding structure.

15. The method of any one of claims 11 to 13, wherein the set inorganic material is selected from the list consisting of gypsum, a carbonate or an oxide.



PRIOR ART

FIG. 1



PRIOR ART

FIG. 2

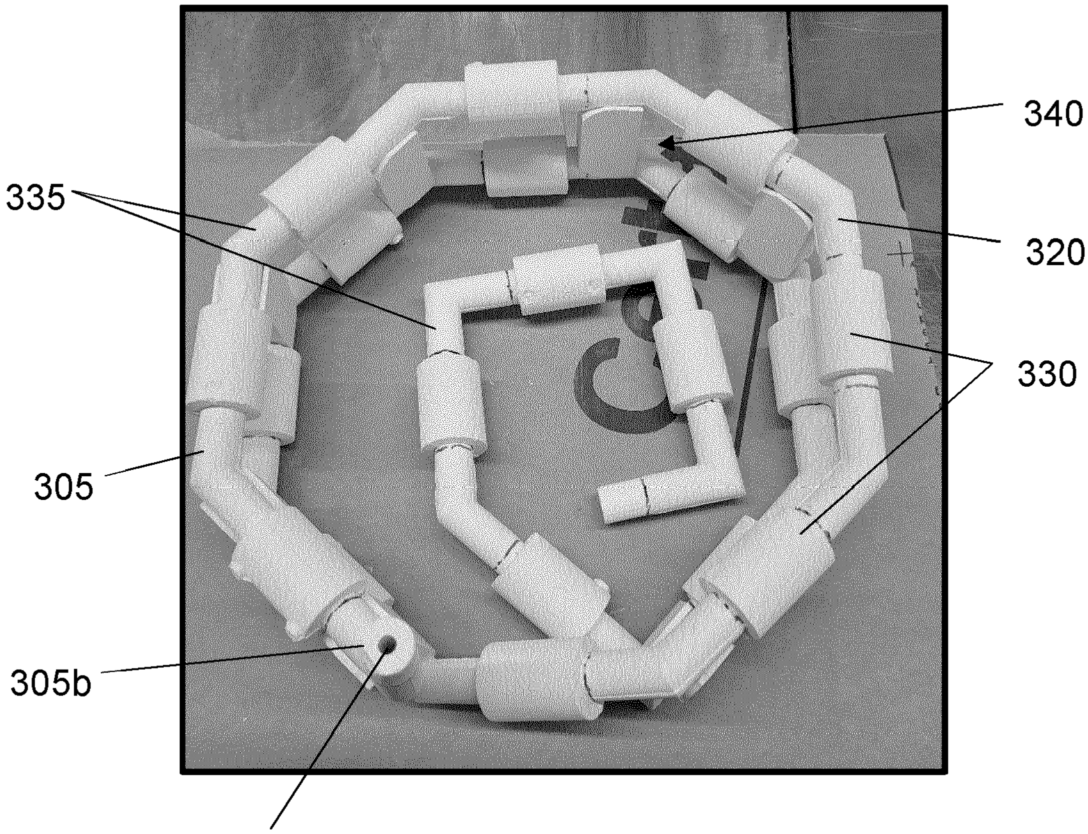


FIG. 3

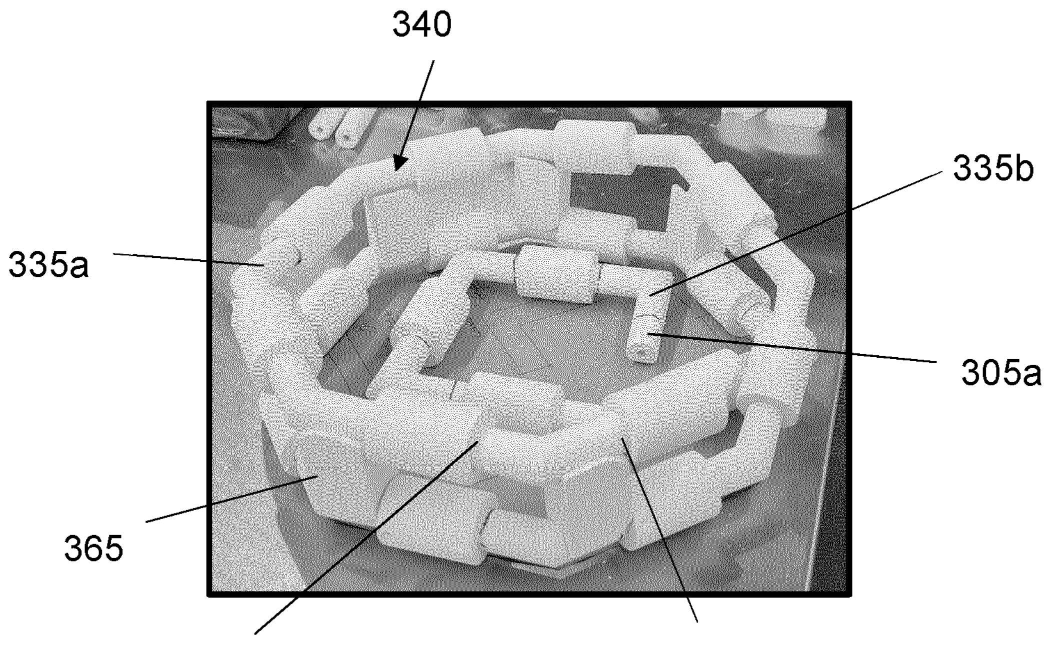


FIG. 4

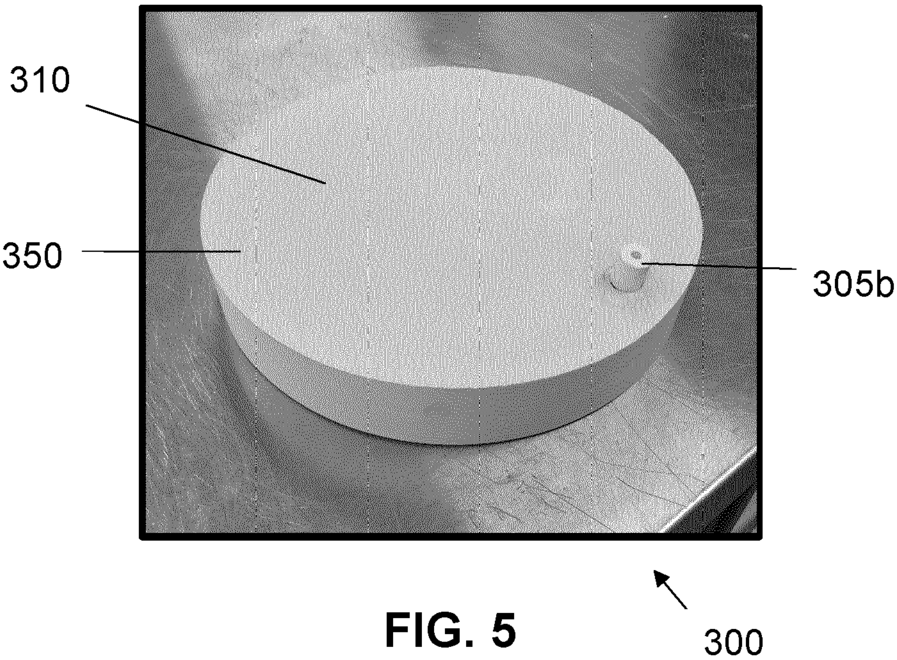


FIG. 5

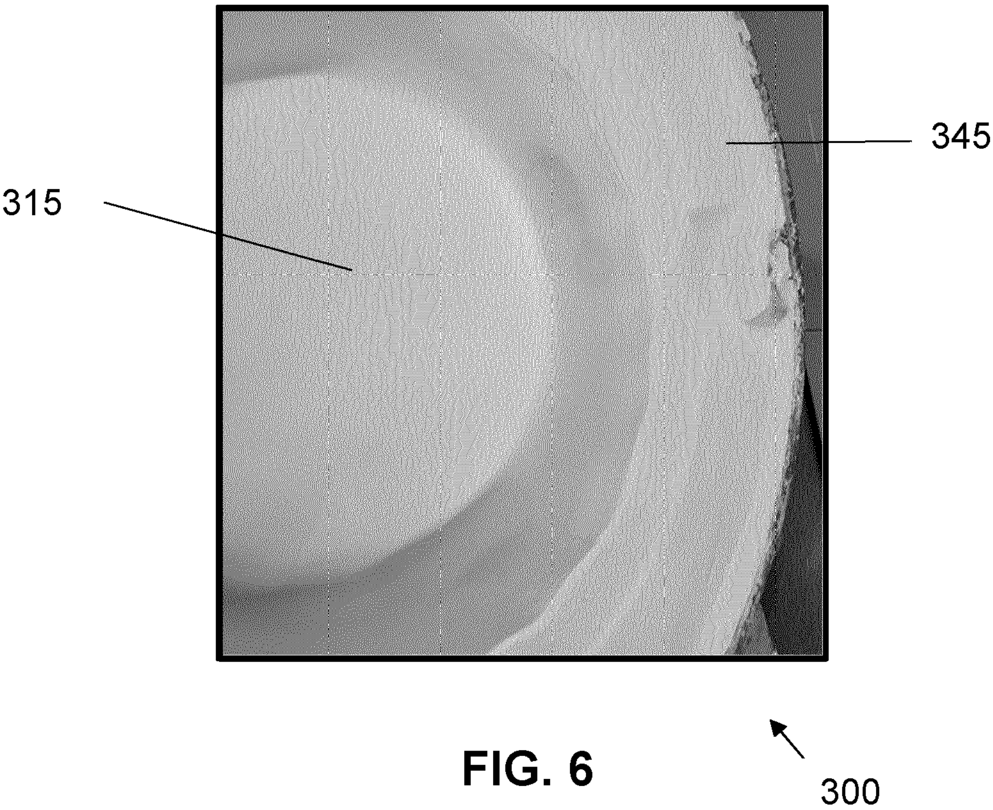


FIG. 6

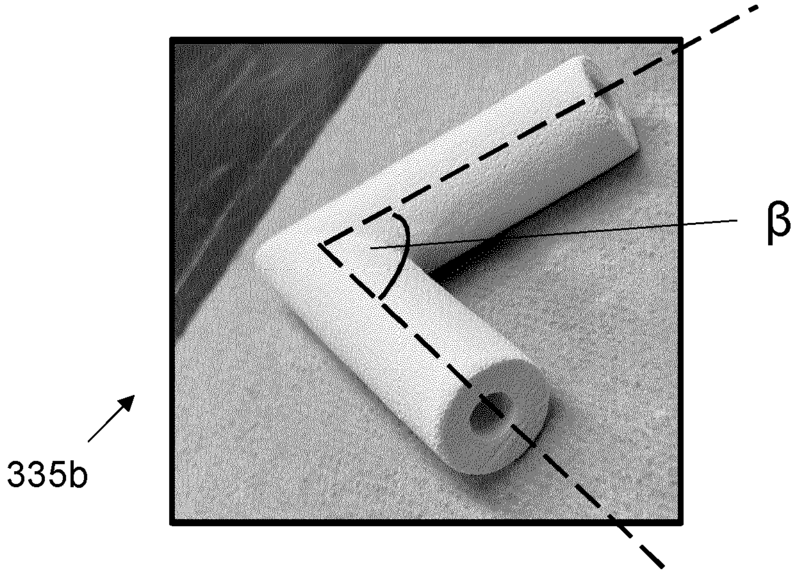

β
335b

FIG. 7

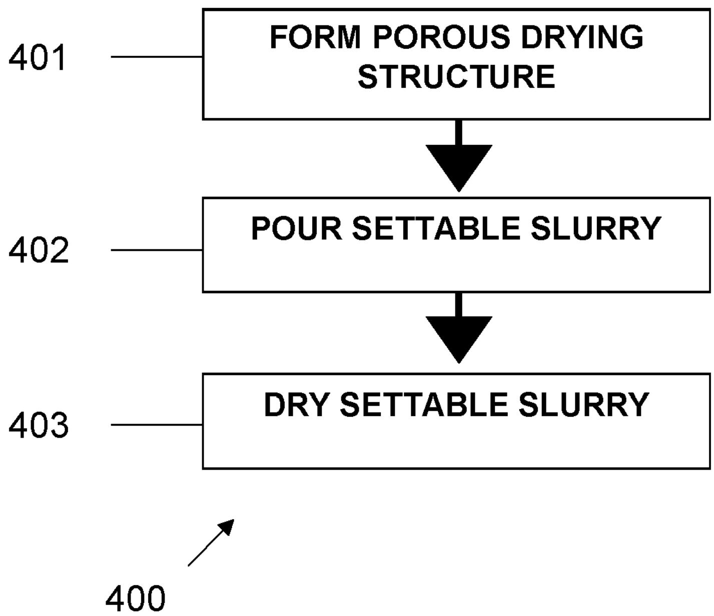

401
FORM POROUS DRYING STRUCTURE
402
POUR SETTABLE SLURRY
403
DRY SETTABLE SLURRY
400

FIG. 8

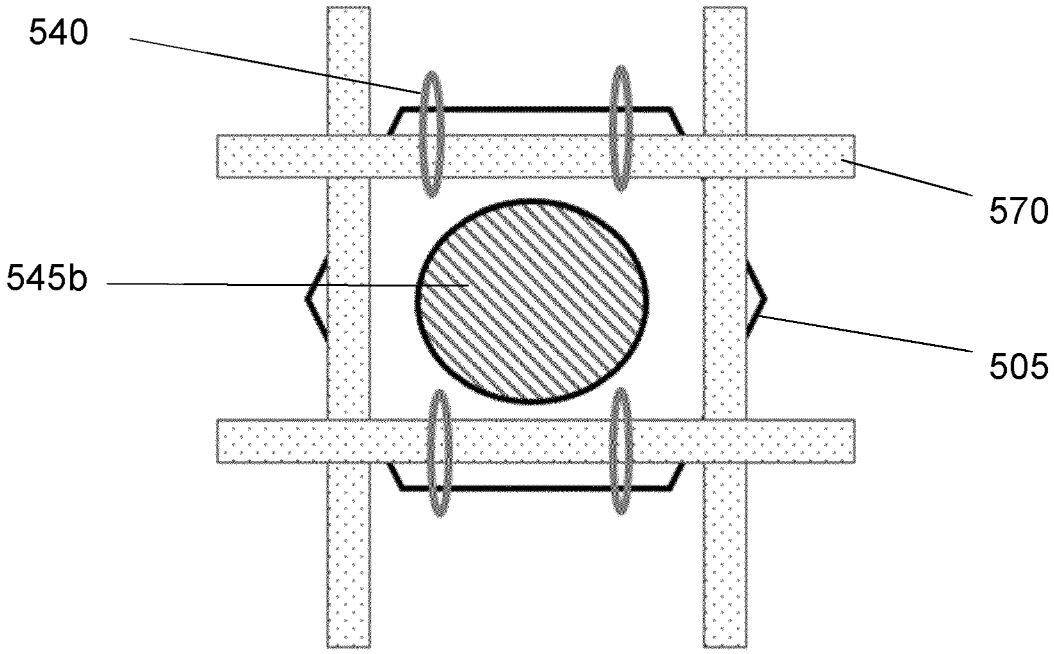


FIG. 9A

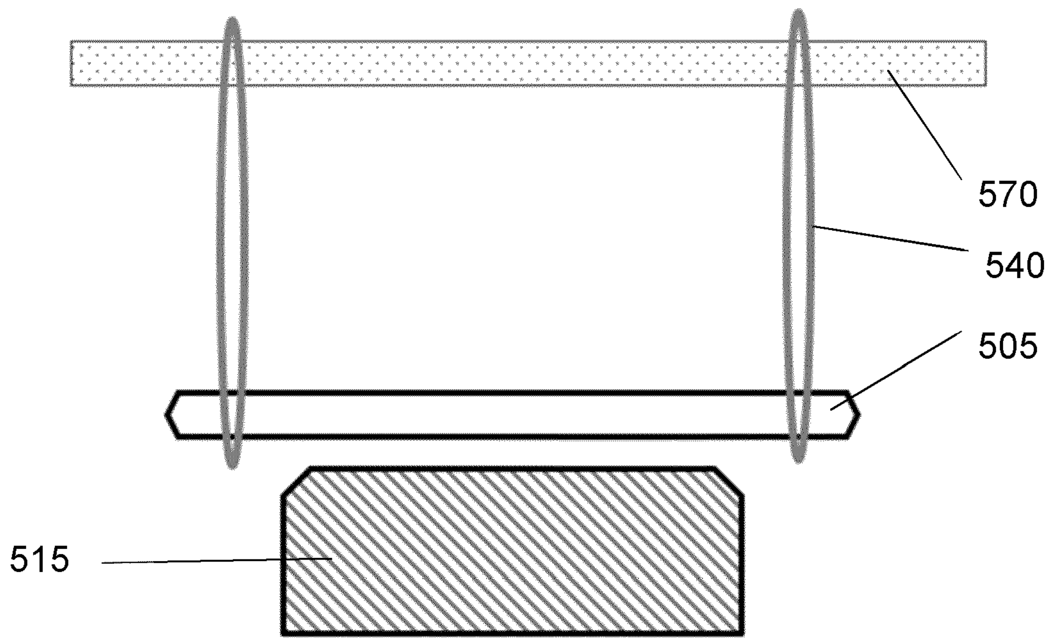


FIG. 9B

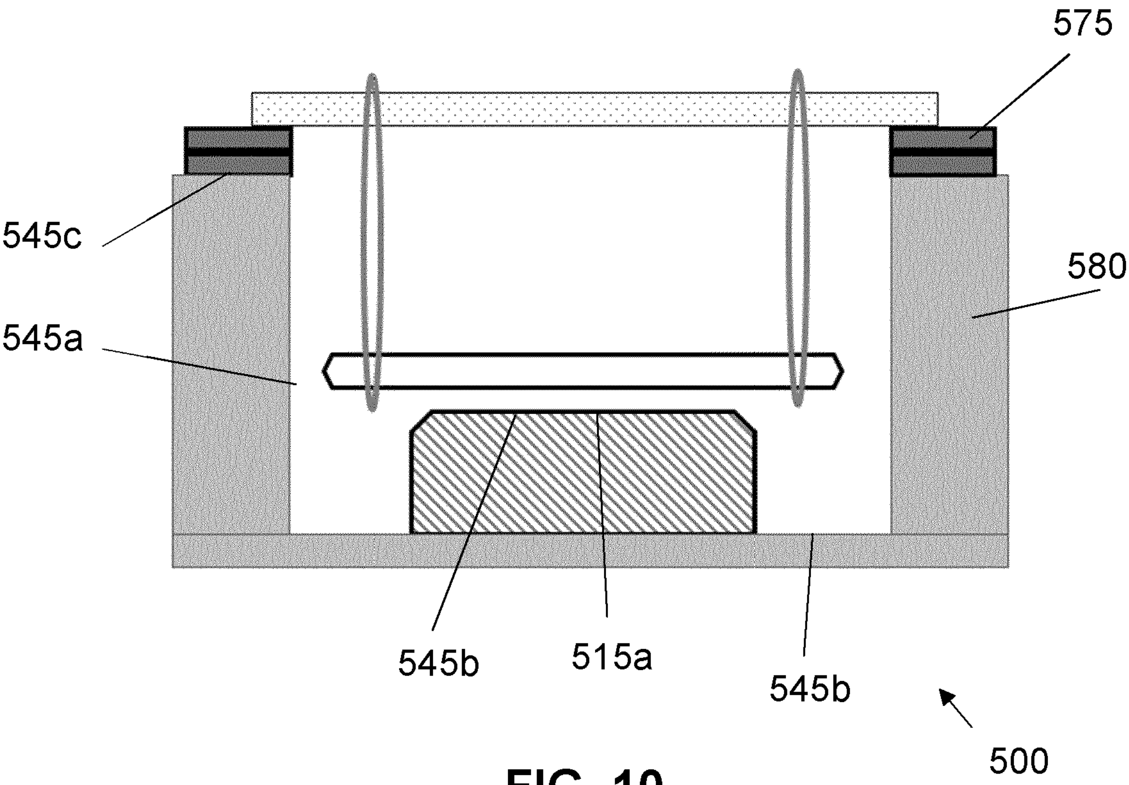


FIG. 10

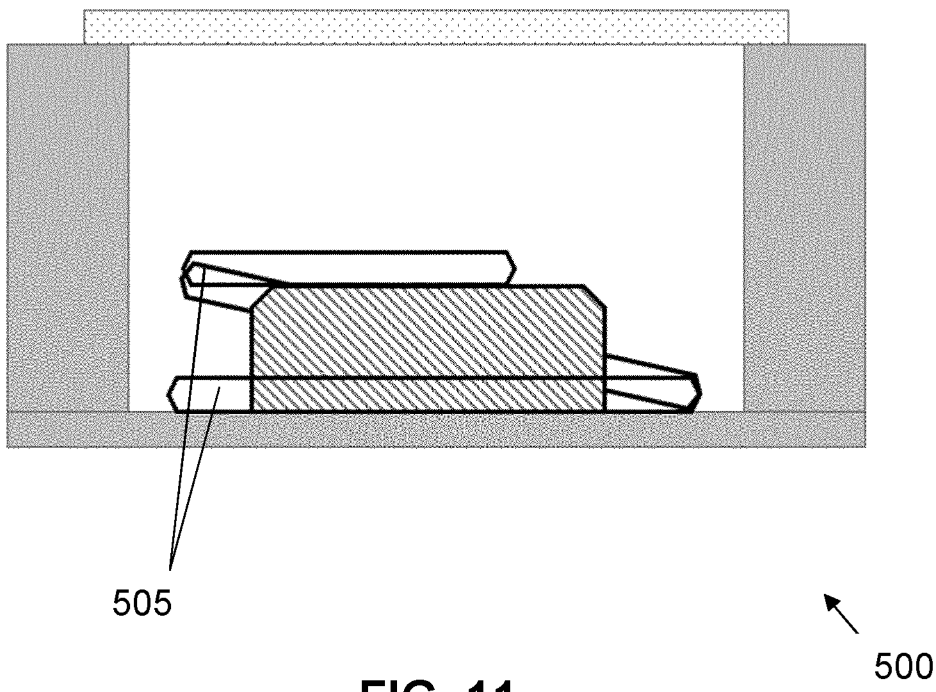


FIG. 11

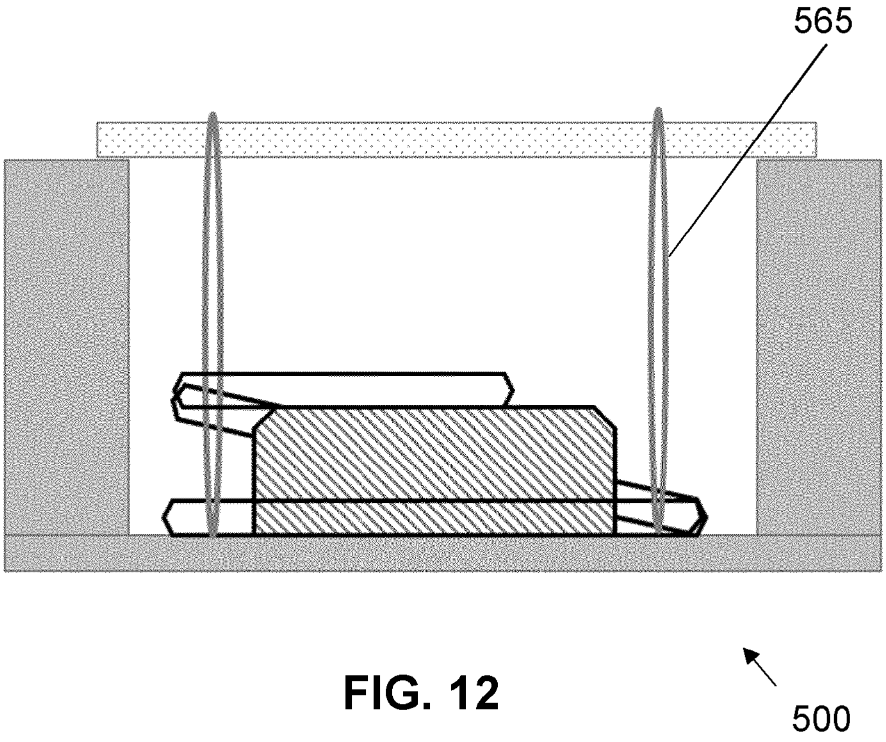


FIG. 12

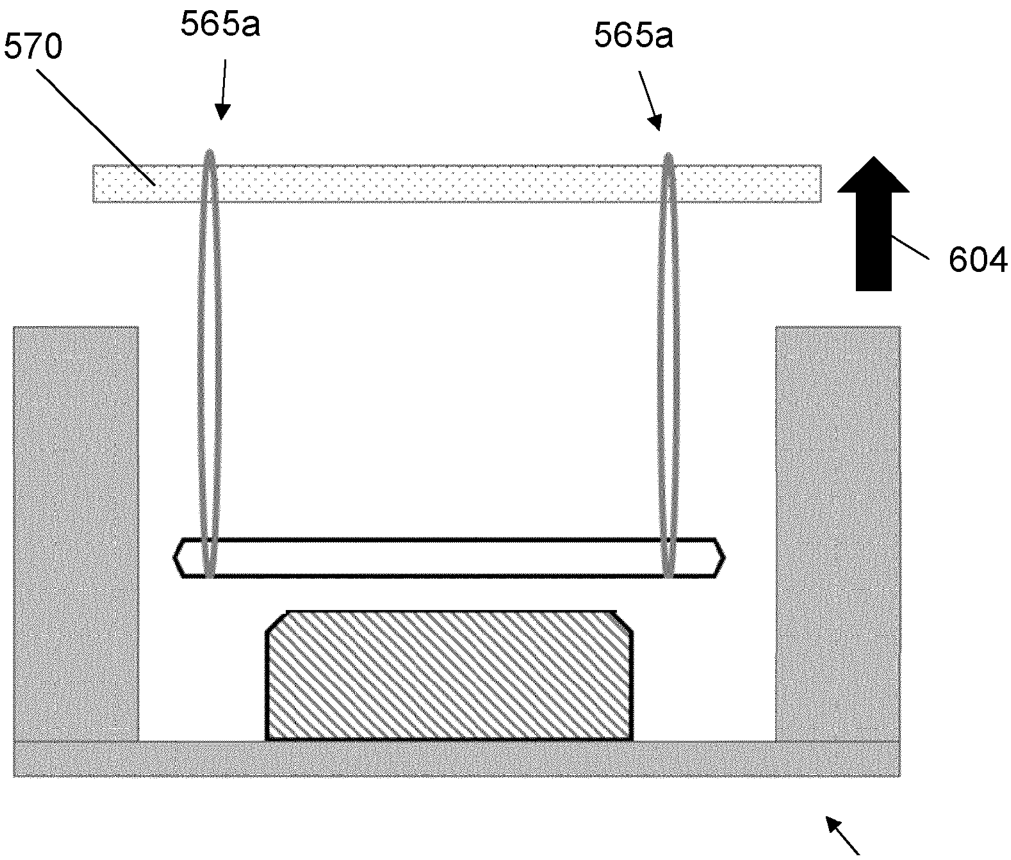


FIG. 13

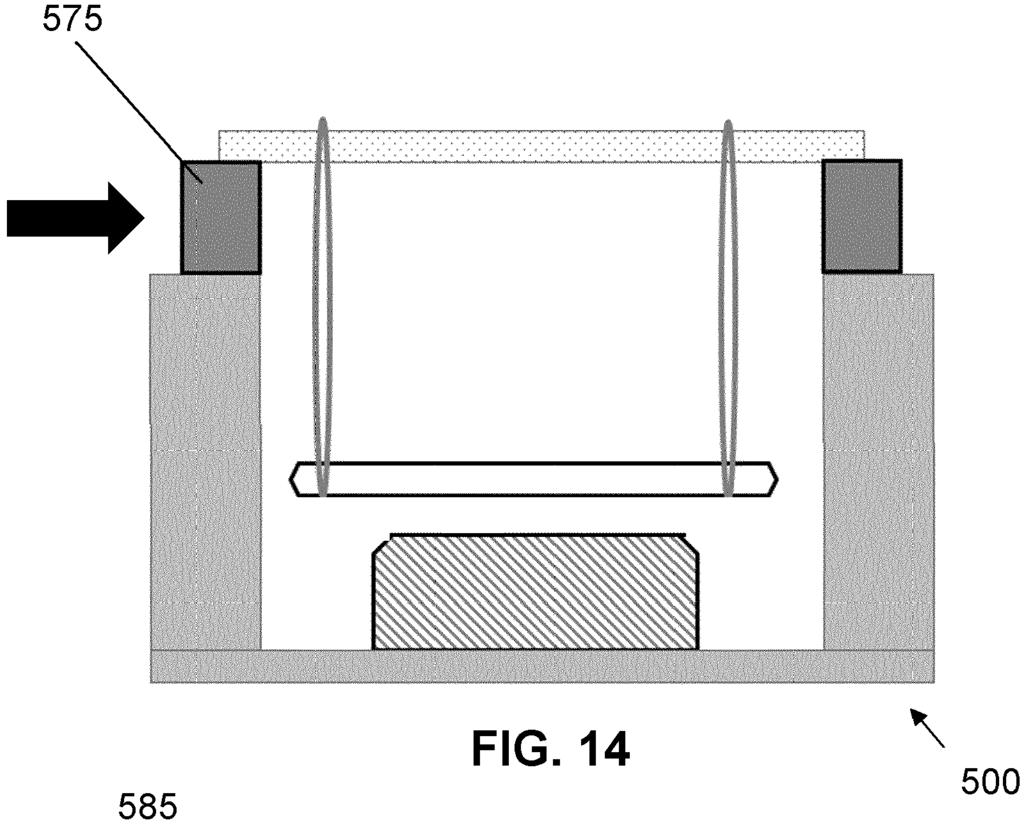


FIG. 14

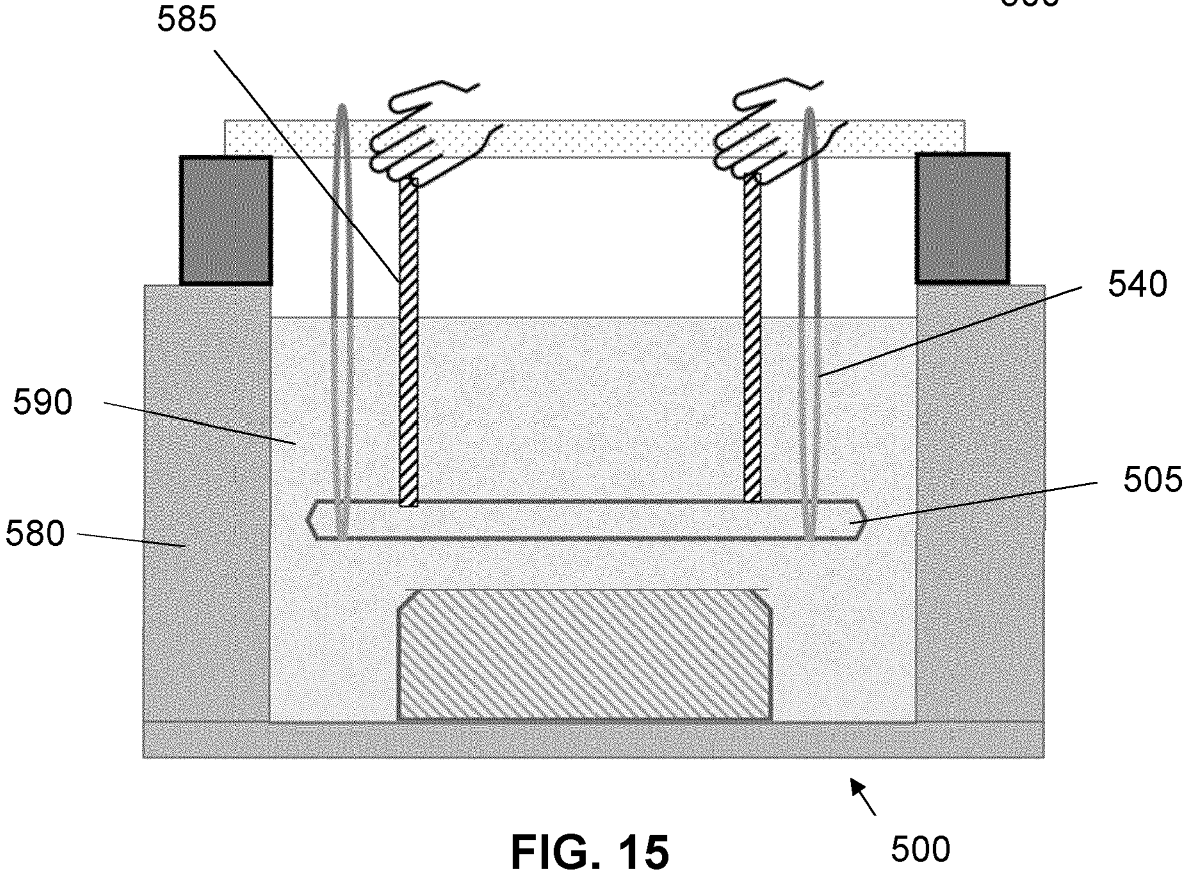


FIG. 15

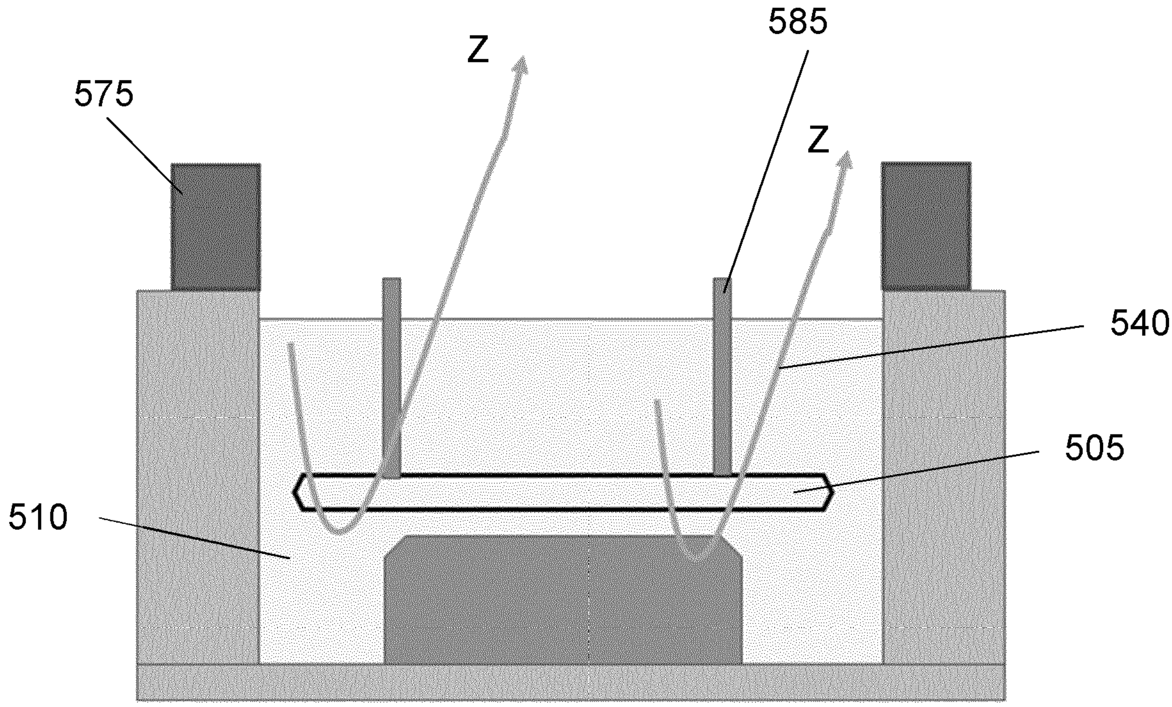


FIG. 16

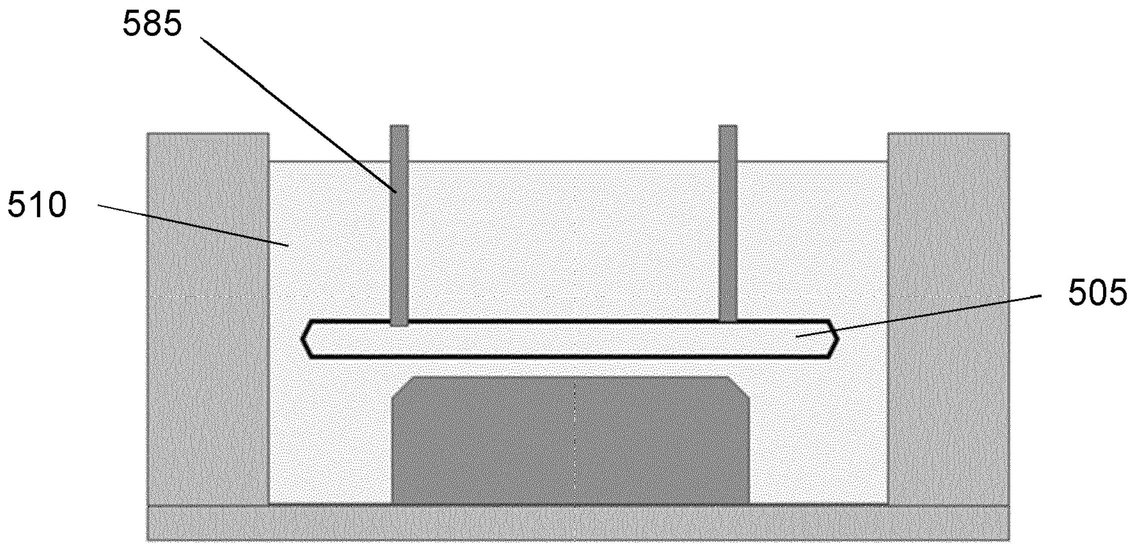


FIG. 17

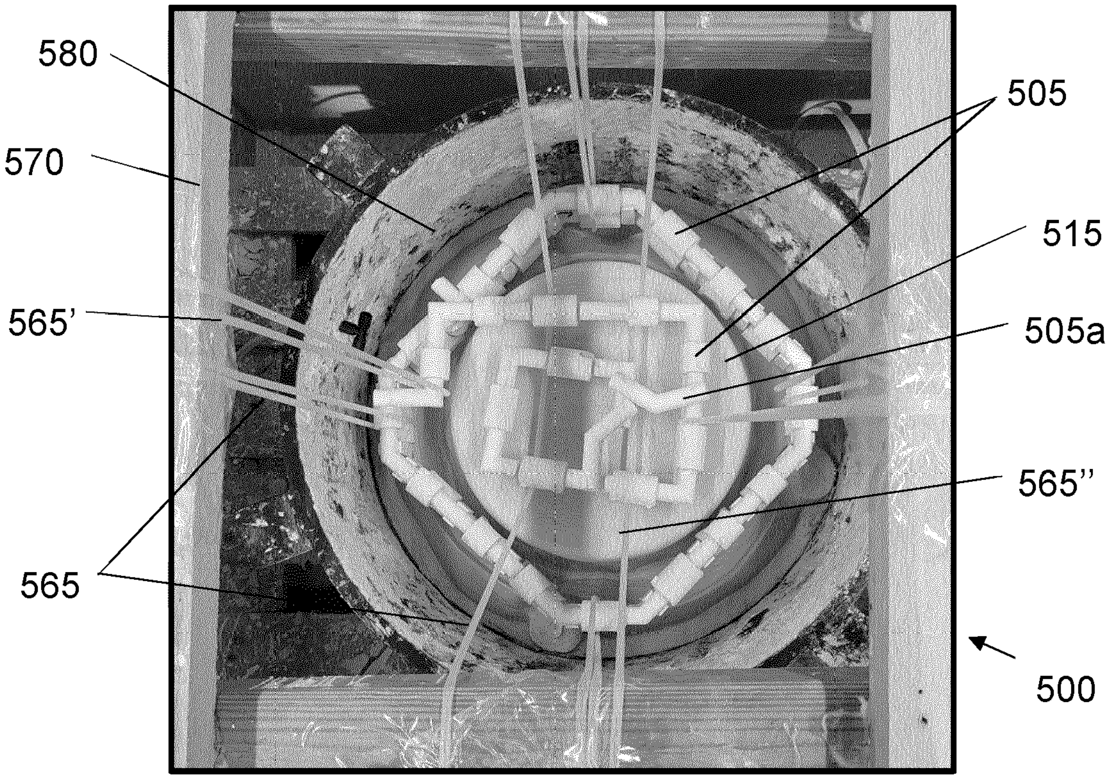


FIG. 18

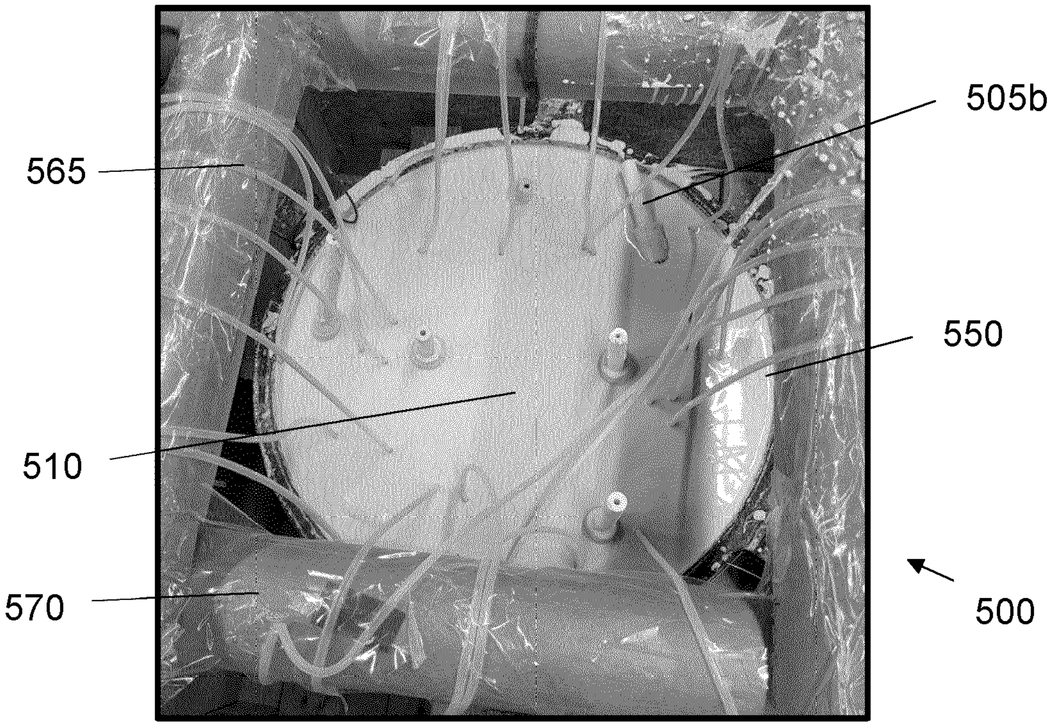


FIG. 19

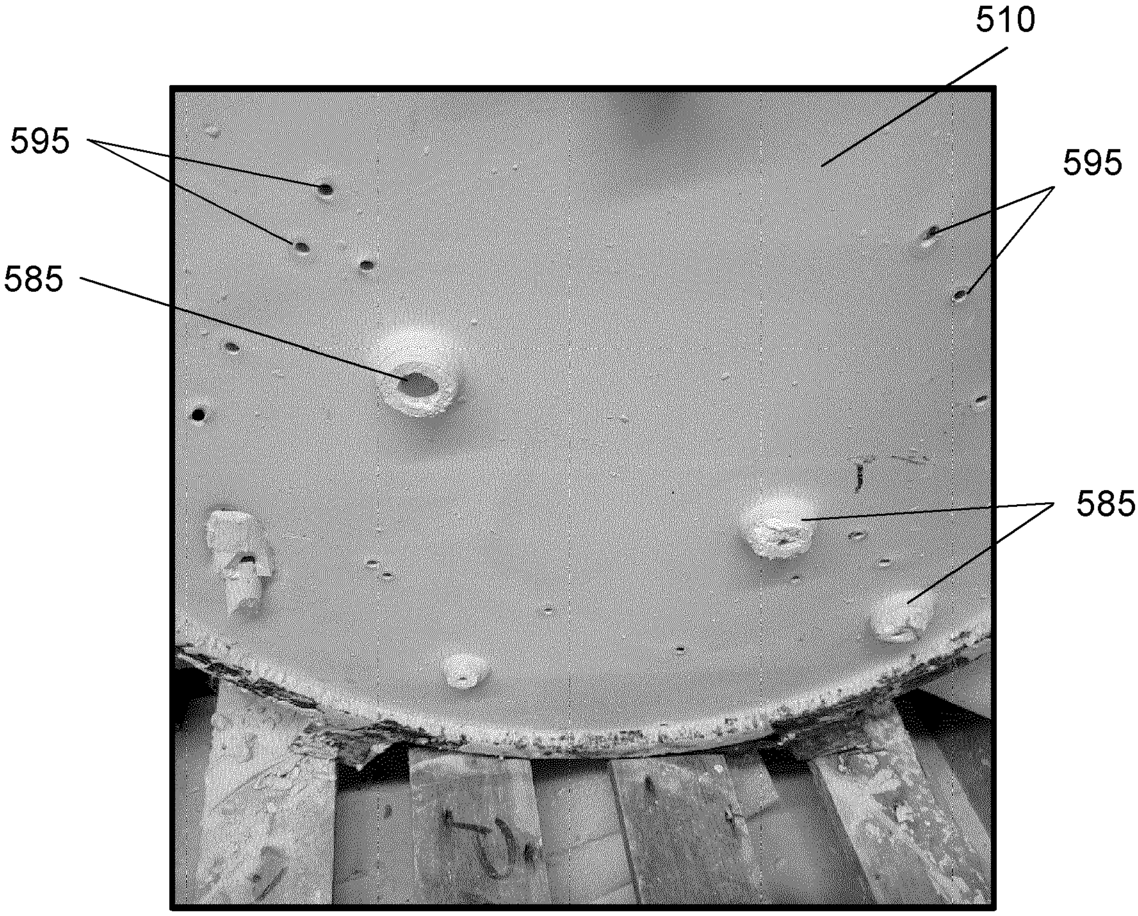


FIG. 20

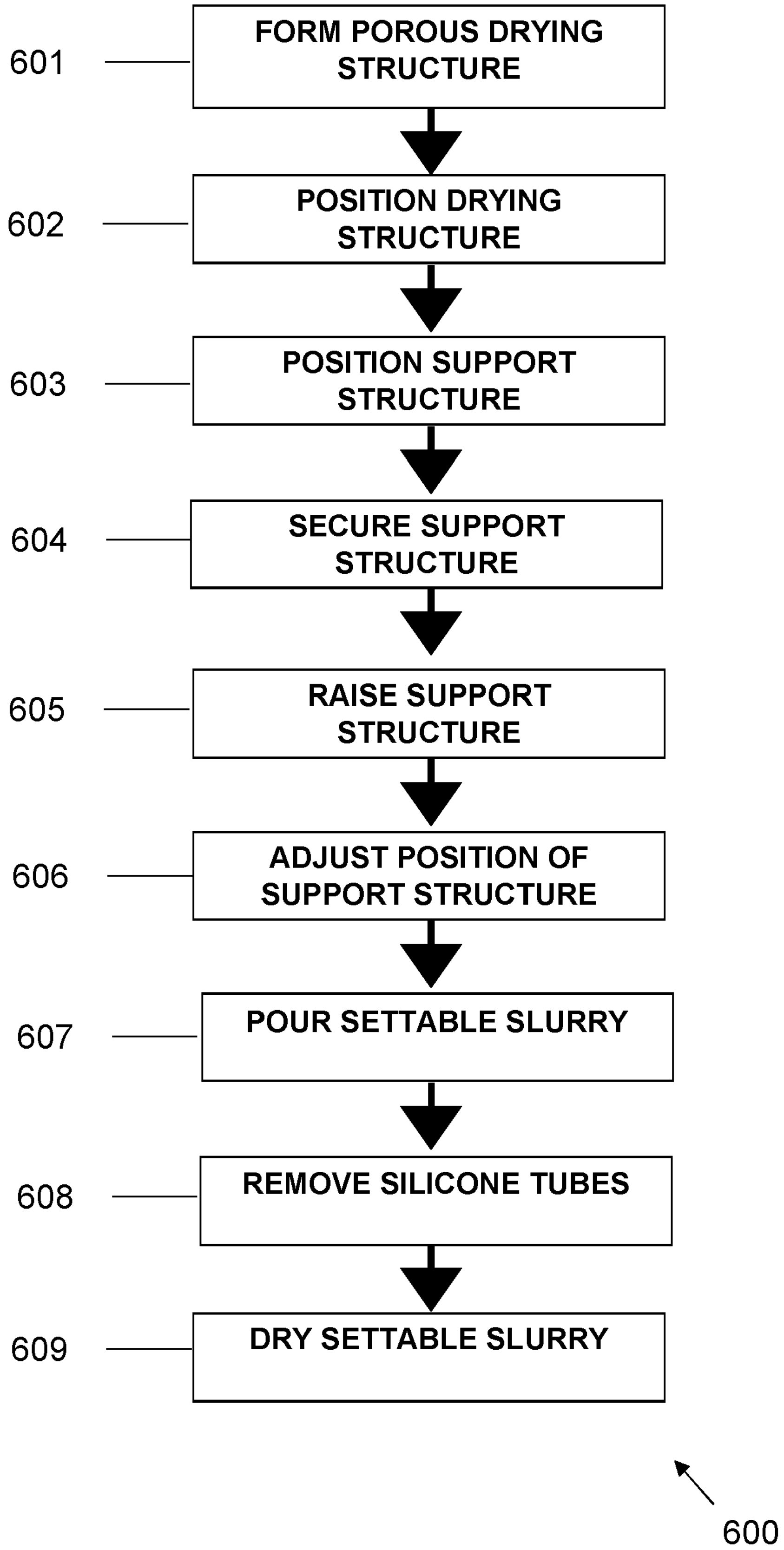

601
FORM POROUS DRYING STRUCTURE
602
POSITION DRYING STRUCTURE
603
POSITION SUPPORT STRUCTURE
604
SECURE SUPPORT STRUCTURE
605
RAISE SUPPORT STRUCTURE
606
ADJUST POSITION OF SUPPORT STRUCTURE
607
POUR SETTABLE SLURRY
608
REMOVE SILICONE TUBES
609
DRY SETTABLE SLURRY
600

FIG. 21

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	24 May 2024	Papakostas, Ioannis

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EUROPEAN SEARCH REPORT

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