Claims

1. System (1) for application of a curable building material, the system comprising: a mixing apparatus (10) for mixing individual components of the curable building material to give a curable building material in the setting state;
a printing head (3) which is movable in at least one direction in space and by means of which setting building material can be applied;
a transport conduit (12) by means of which setting building material can be conveyed from the mixing apparatus (10) to the printing head (3);
at least one transport device (30) for transporting setting building material from the mixing apparatus (10) through the transport conduit (12) to the printing head (3);
a feed device (9) which is configured so that at least two separate components of the curable building material can be introduced via at least two separate inlets (10.1, 10.2, 10.3) into the mixing apparatus (10), in particular into a mixing chamber of the mixing apparatus; wherein the mixing apparatus (10) comprises a dynamic mixer and a static mixer, where preferably the static mixer is arranged in the transport conduit (12) and/or in the printing head (3); wherein:
- a first component of the building material is present in solid form and comprises a mineral binder and optionally aggregates, in particular gravel, sand, rock particle fractions and/or fillers, and optionally a concrete and/or mortar admixture;
- a second component of the building material is present in liquid form and comprises water;

where the components are present in vessels (11.1, 11.2, 11.3, 11.4) which are spatially separated from one another and are constituents of the feed device (9) and/or communicate with the latter;
wherein the first component comprises a dry mineral binder composition comprising cement and mineral fillers, where the binder composition comprises at least one setting accelerator based on aluminium sulfate, at least one superplasticizer based on a polycarboxylate ether and at least one rheological auxiliary, where the polycarboxylate ether has at least 1 mmol, in particular at least 1.2 mmol, especially at least 1.8 mmol, of carboxylic acid groups per gram of dry polycarboxylate ether.

~~2. System according to Claim 1, wherein the mixing apparatus (10), in particular a dynamic mixer, is not arranged on the movable printing head (3) and/or no mixing apparatus, in particular no dynamic mixer, is arranged on the movable printing head (3).~~

~~3. System according to at least one of Claims 1 - 2, wherein the mixing apparatus (10) comprises a dynamic mixer and a static mixer, where preferably the static mixer is arranged in the transport conduit (12) and/or in the printing head (3).~~

2~~4~~. System according to ~~at least one of Claims 1 – 3~~claim 1, wherein there is an inlet nozzle (5) for admixing an additive to the setting building material in the transport conduit (12) and/or in the region of the printing head (3), especially for influencing the chemical and/or physical properties of the setting building material.

3~~5~~. System according to at least one of Claims 1 – 2~~4~~, wherein there is an apparatus for aerating and/or deaerating (7) the setting building material, in particular an air supply system, a vacuum treatment apparatus and/or a vibration apparatus, where preferably the apparatus for aerating and/or deaerating (7) is present on or in the transport conduit and/or the printing head.

46. System according to at least one of Claims 1 – 35, wherein there is an apparatus for changing the temperature of the setting building material, in particular a heating element and/or a cooling element, where preferably the apparatus for changing the temperature is present on or in the transport conduit (12) and/or the printing head (3).

57. System according to at least one of Claims 1 – 46, wherein there is a measuring unit (13) for determining a chemical and/or physical property of the setting building material in the mixing apparatus (10), in the transport conduit (12), in the printing head (3) and/or after the delivery from the printing head (3), where preferably the measuring unit (13) comprises a temperature measuring apparatus, a pressure measuring apparatus, a humidity measuring apparatus, a measuring apparatus for determining the electrical conductivity, an ultrasound transducer and/or a rheometer.

68. System according to Claim 57, wherein the measuring unit (13) is designed so that the determination of the chemical and/or physical property can be carried out during application of the building material, in particular in real time.

79. System according to at least one of Claims 1 - 68, wherein an outlet (4) which is controllable in respect of the size of the through-opening is present on the printing head (3), with the outlet (4) preferably being completely closable.

810. System according to at least one of Claims 1 - 79, wherein a control unit (14) is present.

911. System according to Claim 810, wherein the control unit (14) is configured so that the transport power of the transport device (30) is or can be controlled and/or regulated on the basis of a chemical and/or physical property of the curable building material determined using the measuring unit (13), in particular on the basis of a pressure of the curable building material in the transport conduit (12) and/or in the printing head (3).

1012. System according to at least one of Claims 810 - 911, wherein the control unit (14) is configured so that an addition rate of at least one component of the curable building material by means of the feed device (9) is or can be regulated as a function of the chemical and/or physical property of the curable building material.

11~~13~~. System according to at least one of Claims 1 – 10~~12~~, wherein:

~~- a first component of the building material is present in solid form and comprises a mineral binder and optionally aggregates, in particular gravel, sand, rock particle fractions and/or fillers, and optionally a concrete and/or mortar admixture;~~

~~- a second component of the building material is present in liquid form and comprises water;~~

- an optional third component comprising a plasticizer is present;

- an admixture which can be added via the inlet nozzle (5) and preferably comprises a plasticizer, a rheological auxiliary and/or a retarder is optionally present;

where the components and optionally the admixture are present in vessels (11.1, 11.2, 11.3, 11.4) which are spatially separated from one another and are constituents of the feed device (9) and/or communicate with the latter.

~~14. System according to Claim 13, wherein the first component comprises a dry mineral binder composition comprising cement and mineral fillers, where the binder composition comprises at least one setting accelerator based on aluminium sulfate, at least one superplasticizer based on a polycarboxylate ether and at least one rheological auxiliary, where the polycarboxylate ether has at least 1 mmol, in particular at least 1.2 mmol, especially at least 1.8 mmol, of carboxylic acid groups per gram of dry polycarboxylate ether.~~

12~~15~~. Use of a system (1) according to at least one of Claims 1 - 11~~14~~ for producing three-dimensional objects from curable building materials, in particular from mineral binders or mineral binder compositions, especially from concrete or mortar compositions.