

[CLAIMS]

[Claim 1]

A machine tool which is disposed to remove and add a material on a workpiece positioned in a work station,

5 the machine tool comprising:

a plurality of exchangeable heads comprising a first head disposed to remove a material from the workpiece positioned at least in the work station, and a second head disposed to add a material to the workpiece positioned in the work station;

10 a first carriage, the first head being removably mounted on the first carriage, the first carriage being disposed to be movable along two or more axial lines; and

a second carriage, the second head being removably mounted on the second carriage, the second carriage being disposed to be movable along two or more axial line,

wherein the machine tool is disposed to control an environment of the work station,

15 wherein the machine tool comprises a clean side and an unclean side, and the first carriage is used for unclean processing and the second carriage is used for clean processing,

wherein one of the first head and the second head is disposed to perform two processing steps simultaneously while being maintained in the first carriage or the second carriage.

[Claim 2]

The machine tool of claim 1,

20 wherein a first step of the two processing steps performed simultaneously comprises heating the material or the workpiece, and a second step of the two processing steps performed simultaneously comprises deposition of the material or pressure processing of the workpiece.

[Claim 3]

The machine tool of claim 1,

wherein one of the first head and the second head disposed to perform the two processing steps simultaneously is disposed to apply heat to the material or the workpiece and simultaneously to perform deposition of the material.

[Claim 4]

5 The machine tool of claim 3,
 wherein heating is performed by induction heating.

[Claim 5]

 The machine tool of claim 3,
 wherein the deposition is performed by extrusion.

10 [Claim 6]

 The machine tool of claim 1,
 wherein one of the first head and the second head disposed to perform the two processing steps simultaneously is disposed to perform deposition on the workpiece and simultaneously to perform pressure processing on the workpiece.

15 [Claim 7]

 The machine tool of claim 6,
 wherein the pressure processing is discontinuous.

[Claim 8]

 The machine tool of claim 1,
20 wherein the two processes performed simultaneously is selected from one of combinations of:

 applying heat and removing the material;
 applying induction heating and using a laser process;
 depositing the material and examining the deposited material;

depositing the material and moving the workpiece;
moving the workpiece and performing another process;
processing the workpiece and examining the workpiece;
preliminarily processing and processing;
5 processing and deposition processing;
using multiple examination means; and
using an examination means and an illumination means.

[Claim 9]

10 The machine tool of claim 1,
wherein one of the first head and the second head disposed to perform the two processing
steps simultaneously is configured to deposit a first material which is heated, and to extrude the
first material and a second material.

[Claim 10]

15 The machine tool of claim 9,
wherein the head further comprises a cutting means which is disposed to cut the second
material.

[Claim 11]

The machine tool of claim 1,
20 wherein the machine tool has a storage place to store the plurality of exchangeable heads,
and a tool exchanger.

[Claim 12]

The machine tool of claim 1,
wherein the first head is disposed to be movable along two, three, four, or five axial lines

when the first head is removably mounted in the first carriage.

[Claim 13]

The machine tool of claim 1,

wherein the second head is disposed to be movable along two, three, four, or five axial

5 lines when the second head is removably mounted in the second carriage.

[Claim 14]

The machine tool of claim 1,

wherein the work station is provided with a chamber which is sealable at least in part, and the workpiece is positioned in the chamber when in use.

10 [Claim 15]

The machine tool of claim 1,

wherein the machine tool further comprises an integral docking system disposed to supply a processing material to the second head which is maintained in the second carriage.

[Claim 16]

15 The machine tool of claim 15,

wherein the second head comprises a receiving docking manifold, and the machine tool has a supply docking manifold disposed on the second head to be connected with the receiving docking manifold.

[Claim 17]

20 The machine tool of claim 16,

wherein the machine tool comprises a spindle to mount the second head which is maintained in the second carriage and disposed to be movable in a z direction, and the receiving docking manifold of each head is disposed in parallel with or adjacent to the spindle.

[Claim 18]

The machine tool of claim 17,

wherein the supply docking manifold is provided on a collar of the spindle.

[Claim 19]

The machine tool of claim 17,

5 wherein the receiving docking manifold is rotatable to a predetermined position.

[Claim 20]

The machine tool of claim 17,

wherein the receiving docking manifold is disposed to be connected along an axial line which is transverse to the spindle or an axial line which is parallel to the spindle.

10 [Claim 21]

The machine tool of claim 17,

wherein the supply docking manifold is combined into a column of the spindle or a spindle housing.

[Claim 22]

15 The machine tool of claim 21,

wherein the supply docking manifold and the receiving docking manifold are disposed to supply a material for deposition to the second head.

[Claim 23]

The machine tool of claim 16,

20 wherein the docking manifolds are disposed to transmit data to the second head and to receive data from the second head.

[Claim 24]

The machine tool of claim 16,

wherein the docking system is disposed to provide a clean connection portion between the

supply docking manifold on the machine tool and the receiving docking manifold on the second head.

[Claim 25]

The machine tool of claim 24,

5 wherein the machine tool comprises an operable seal provided on at least a half of the connection portion.

[Claim 26]

The machine tool of claim 1,

10 wherein the machine tool further comprises a supply unit disposed to supply or to be able to supply a power source to the first head which is mounted in the first carriage or the second head which is mounted in the second carriage.

[Claim 27]

The machine tool of claim 1,

wherein a material for deposition is one or more of:

15 powder, a filament, a rod, a fiber (a short fiber, a chopping fiber, a long fiber or a continuous fiber) sheet, or metal formed with wire, nonmetal, polymer, ceramic, clay, salt, a conductive material, a capacitive material, or a dielectric material which is suspended in one of liquid, emulsion, gas, aerosol, paste, a fluid in the form of solid or semi-liquid or perfect liquid or a cooling fluid or a processed fluid, gas and a mixture thereof.

20 [Claim 28]

The machine tool of claim 1,

wherein at least one of the plurality of exchangeable heads is disposed to extrude the material on the workpiece, and the machine tool comprises a spindle to mount the first head or the second head, and an amount of extruded material is directly controlled by rotation of the spindle.

[Claim 29]

The machine tool of claim 1,

wherein the plurality of exchangeable heads comprise:

an additional head having a first deposition characteristic to introduce a material

5 having a characteristic of a first set onto the workpiece in the work station; and

a second additional head having a second deposition characteristic different from

the first deposition characteristic to introduce a material having a characteristic of a second set

which is different from the characteristic of the first set onto the workpiece in the work station;

and

10 wherein the machine tool is disposed to automatically change the additional head to the second additional head, and the second deposition characteristic is disposed to enhance fidelity of an article to be manufactured to a desired article.

[Claim 30]

The machine tool of claim 1,

15 wherein the machine tool is disposed to perform a workpiece processing step comprising:

i) a step of using an additional head having a first deposition characteristic to introduce a material having a characteristic of a first set; and

ii) a step of changing the additional head to a second additional head, and

20 wherein the second additional head is disposed to analyze at least one of an article to be manufactured and a function of a head.

[Claim 31]

The machine tool of claim 1,

wherein an additional head is disposed to discharge a fluid on an article under examination,

wherein the additional head or a second additional head are disposed to be coupled to the

article under examination through the fluid, and

wherein the machine tool is disposed to transmit a signal through the fluid to examine the article.

[Claim 32]

5 The machine tool of claim 1,

wherein the machine tool is disposed to perform a workpiece processing step comprising:

i) a step of using an additional head having a first deposition characteristic to introduce a material having the characteristic of the first set; and

ii) a step of processing an article to be manufactured by pressure processing.

10

[Claim 33]

The machine tool of claim 1,

wherein the plurality of exchangeable heads comprise a processing head having a reserver of a component which is usable to deposit on the workpiece.

15 [Claim 34]

The machine tool of claim 1,

wherein the plurality of exchangeable heads comprise a processing head having an automation means configured to move the workpiece or a part of the workpiece.

[Claim 35]

20 The machine tool of claim 1,

wherein the clean side comprises a chamber which is sealable and stores at least one second head therein when the second head is not in use.

[Claim 36]

The machine tool of claim 1,

wherein the work station is positioned between the clean side and the unclean side.

[Claim 37]

The machine tool of claim 14,

wherein the chamber of the work station is shaped to collect a waste material dropped

5 from the workpiece while the second head is being used.

[Claim 38]

The machine tool of claim 37,

wherein the machine tool comprises a collection tray to collect a waste material dropped

from the workpiece while the first head is being used.

10 [Claim 39]

The machine tool of claim 38,

wherein the collection tray is slidable in and out from the chamber of the work station.