受験番号:36IPE004

Q1

In recent years, the development of 3D printers of a layer stacking type, which implement a building method of forming a layered form (structure) by stacking layers on the basis of a 3D printing technology, has been advancing in a construction field regardless of domestic or overseas. A material used for a 3D printer of the layer stacking type is basically a cement-based material. Mortar kneaded by a mixer is pumped by a pump and supplied to a three-dimensional formation apparatus. Construction with a 3D printer of the layer stacking type enables a structure to be formed by stacking layers without the use of molds. It is expected that the construction is highly advantageous when compared with conventional concrete construction in terms of labor saving, degree of freedom in design, safety, and the like.

[0003]

To put such a construction method in practical application in the future, it is necessary to develop and improve 3D printers, as well as to examine the pumpability of material, self-standing properties of material immediately after discharged from a nozzle to a layered form (structure), surface texture of a layered body after hardened, and the like.

[0004]

Forming a layered form (structure) with high construction accuracy mainly requires the development of a material with high self-standing performance, and the development of machinery in terms of positional accuracy and speed of a nozzle, discharge amount of material, and the like. Further, a structural performance that enables a formed construct (a structural form) to exert sufficient strength for various external forces is required.

Q2

[0037]

The high frequency inverter 12 of the power transmitting unit 1 and the high frequency rectifier circuit 22 of the power receiving unit 2 are each constituted by four reverse-conducting power semiconductor switches ($Q_1$ to $Q_4$), such as MOSFETs and IGBTs, which constitute the full-bridge circuit. Specifically, the high frequency inverter 12 and the high frequency rectifier circuit 22 are each constituted by a pair of inverter legs. In the inverter legs, a high-side switching element ($Q_1$) and a low-side switching element ($Q_2$) are connected together in series, a high-side switching element ($Q_3$) and a low-side switching element ($Q_4$) are connected together in series, and each of the switching elements is connected in parallel to a reverse parallel diode. Further, to the high frequency inverter 12 of the power transmitting unit 1, a phase-shift pulse-width modulation method that is capable of adjusting a high frequency output only by performing phase control on driving timings of the switching elements ($Q_1$ to $Q_4$) is applied.

[0038]

The voltage smoothing capacitor 24 connected in parallel to the battery 21 of the power receiving unit 2 smooths a signal by suppressing ripples produced after the rectification by the high frequency rectifier circuit 22 so as to make the signal closer to a direct current.

[0039]

The power transmitting side resonance circuit 13 is constituted by a reactor ($L_1$) and a variable capacitor ($C_1$), and the power receiving side resonance circuit 23 is constituted by a reactor ($L_2$) and a variable capacitor ($C_2$). An ultrasonic transducer including a piezoelectric body, such as the BLT, is a capacitive load (C type load). Accordingly, the ultrasonic transducer may be combined with the reactor to implement the resonance circuit.

[0040]

As described above, since the BLT is given in advance a compressive stress with a bolt, the BLT is capable of providing a highly large stress amplitude. The BLT can be used as a strong ultrasonic transducer. Further, the BLT has a high mechanical strength and has a high electro-acoustic conversion efficiency. The BLT is therefore suitable for contactless ultrasound power transmission in the sea. The BLT has a natural mechanical resonance frequency. By driving the BLT at the resonance frequency or a frequency close to the resonance frequency, a highly large stress amplitude can be provided.

Q3

1. A position estimating system that estimates a position of a radio wave receiving device in a predetermined space based on received signal strengths of radio waves transmitted from three or more radio wave transmitting devices and received by the radio wave receiving device in the space, the position estimating system comprising:

acquiring means for acquiring information about the received signal strengths of the radio waves received from the three or more radio wave transmitting devices;

generating means for generating a first vector based on pieces of the information that correspond to at least three radio wave transmitting devices of the three or more radio wave transmitting devices, the first vector including distances between the at least three radio wave transmitting devices and the radio wave receiving device, as elements of the first vector; and

estimating means for estimating the position of the radio wave receiving device based on a similarity between the first vector and a second vector that corresponds to a predetermined position in the space, the second vector including distances between the at least three radio wave transmitting devices and the predetermined position, as elements of the second vector.

2. The position estimating system according to claim 1, wherein

the second vector is generated in such a manner that the second vector corresponds to each of a plurality of positions on a predetermined planar region in the space, and

the estimating means estimates the position of the radio wave receiving device based on a similarity between the first vector and the second vector that corresponds to each of the plurality of positions.

3. The position estimating system according to claim 1 or 2, wherein

the second vector is generated in such a manner that the second vector corresponds to each of a plurality of sets each of which is constituted by at least three radio wave transmitting devices of the three or more radio wave transmitting devices, the plurality of sets having different combinations of the at least three radio wave transmitting devices,

the generating means generates the first vector for each of the plurality of sets, and

the estimating means estimates the position of the radio wave receiving device based on a similarity between the first vector and the second vector, the first vector being generated for each of the plurality of sets.

【翻訳コメント】

[0002], l.1–l.3：「3D プリント技術を用いて積層造形体(構造物)を積層しながら造形する構築方法である積層型 3D プリンター」は、「3D プリント技術を用いて積層造形体(構造物)を積層しながら造形する構築方法を実現する積層型 3D プリンター」と解釈して訳しました。