

受験番号:36IPE009

問 1 .

*** START ***

In recent years, in the construction field, both domestic and overseas, development of a lamination-type 3D printer, which uses a construction method of performing shaping while laminating a lamination-formed-body (structure) by using a 3D printing technology has been promoted. As for the material for a lamination-type 3D printer, a cement-based material is basically used, and a mortar obtained through kneading of the material in a mixer is sent under pressure by a pump, to be supplied to a three-dimensional shaping device.

Implementation using a lamination-type 3D printer enables lamination shaping of a structure without use of a mold, and is expected to have a high superiority when compared with that of a conventional concrete implementation in terms of labor-saving, the degree of freedom of design, safety, and the like.

[0003]

In order to put such an implementation method into practical use in the future, in addition to development, improvement, and the like of 3D printers, examination of pumpability of a material, self-standability of the material immediately after being discharged from a nozzle to a lamination-formed-body (structure), surface properties of a hardened laminated body, and the like is necessary.

[0004]

Shaping of a lamination-formed-body (structure) having a high implementation accuracy mainly requires development of a material having a high self-standing performance, and mechanical development in terms of position accuracy and speed of a nozzle, a discharge amount of the material, and the like.

Further, a structural performance for allowing the shaped structure (structure form) to exhibit a sufficient strength against various external forces is required.

*** END ***

問 2.

*** START ***

[0037]

The high frequency inverter 12 of the power transmission unit 1 and the high frequency rectifying circuit 22 of the power receiving unit 2 are each composed of four reverse conduction type power semiconductor switches ($Q_1\sim Q_4$) such as MOSFETs or IGBTs forming a full-bridge circuit.

Specifically, the high frequency inverter 12 of the power transmission unit 1 and the high

frequency rectifying circuit 22 are each composed of a pair of inverter legs in which switching elements (Q₁, Q₃) on the high side and switching elements (Q₂, Q₄) on the low side are connected in series, and anti-parallel diodes are connected in parallel to the respective switching elements. Then, in the high frequency inverter 12 of the power transmission unit 1, a phase shift·pulse width modulation method in which a high frequency output can be adjusted only through phase control of the drive timing of the switching elements (Q₁~Q₄) is applied.

[0038]

The voltage smoothing capacitor 24 connect in parallel to the battery 21 of the power receiving unit 2 smooths a signal so as to be closer to direct current by suppressing a ripple that is caused after rectification at the high frequency rectifying circuit 22.

[0039]

The power-transmission-side resonance circuit 13 and the power-receiving-resonance circuit 23 are composed of reactors (L₁, L₂) and variable capacitors (C₁, C₂), respectively. Since an ultrasonic transducer, such as the BLT, using a piezoelectric body is a capacitor-type load (C-type load), and thus, may be combined with a reactor to realize a resonance circuit.

[0040]

As described above, since the BLT has applied thereto a compressive stress by means of a bolt, a very large stress amplitude can be obtained, and thus, the BLT can be utilized as a strong ultrasonic transducer. In addition, the mechanical strength is large, and electroacoustic conversion efficiency is high. Therefore, the BLT is suitable for ultrasonic noncontact power transmission. The BLT has a unique mechanical resonance frequency. When the BLT is drive at the resonance frequency or a frequency near the resonance frequency, a very large stress amplitude can be obtained.

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翻訳者コメント：電圧平滑用コンデンサ 24 の符号は「25」のように思いましたが、原文通りに訳しております。

問 3.

[Claim 1]

A position estimation system in which, on the basis of a reception signal strength when a radio wave reception device has received within a predetermined space a radio wave transmitted from each of three or more radio wave transmission devices, a position of the radio wave reception device in the space is estimated, the position estimation system comprising:

acquisition means for acquiring information regarding the reception signal strength of the

radio wave received from each of the three or more radio wave transmission devices;

generation means for generating, on the basis of the information corresponding to at least three radio wave transmission devices out of the three or more radio wave transmission devices, a first vector having, as an element, a distance between the radio wave reception device and each of the at least three radio wave transmission devices; and

estimation means for estimating a position of the radio wave reception device on the basis of similarity between the first vector and a second vector corresponding to a predetermined position in the space, the second vector having, as an element, a distance between the predetermined position and each of the at least three radio wave transmission devices.

[Claim 2]

The position estimation system according to claim 1, wherein

the second vector is generated so as to correspond to each of a plurality of positions on a predetermined plain region in the space, and

the estimation means estimates the position of the radio wave reception device on the basis of the similarity between the first vector and the second vector corresponding to each of the plurality of positions.

[Claim 3]

The position estimation system according to claim 1 or 2, wherein

the second vector is generated so as to correspond to each of a plurality of sets each composed of at least three radio wave transmission devices having different combinations out of the three or more radio wave transmission devices,

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

the estimation means estimates the position of the radio wave reception device on the basis of the similarity between the second vector and the first vector for each of the plurality of sets.