BUILD UNIT'S STRIP HEATERS MOISTURE REMOVAL METHOD BY USING HEATING TECHNOLOGY

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Recommended Citation
INC, HP, "BUILD UNIT'S STRIP HEATERS MOISTURE REMOVAL METHOD BY USING HEATING TECHNOLOGY", Technical Disclosure Commons, (May 01, 2020)
https://www.tdcommons.org/dpubs_series/3206

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Build Unit’s strip heaters moisture removal method by using heating technology

Abstract

This disclosure relates to the field of safety in electrical heaters that use Magnesium Oxide as isolator between live and ground.

A process is disclosed that removes the moisture absorbed by the strip heaters by using a heating system, without powering on the three-dimensional build unit, to avoid potential safety users’ issues caused by electrical arcs in the build unit.

Some three-dimensional printing build units use strip heaters technology. The electrical isolation of the strip heaters is made using Magnesium Oxide (MgO) which is a hygroscopic solid material which absorbs humidity from the surrounding environment arising moisture on the strip heaters.

The moisture in the strip heaters makes that their resistance drops till levels around 2-3MΩ when it is supposed to be infinite or beyond 10 MΩ.

When full voltage is applied to a moisture laden heater it could arise that fuses blow, circuit breakers trip, and voltage arcs to the sheath, destruction of the heater or user safety and integrity.

The method described in this disclosure solves the issue by using the Heating System of the 3D printer by creating an initial pre-heating process without the need of electrically connecting the BU and removing moisture to make the machine safe for the user and not compromise the integrity of the system.

This method was validated in different Build Units that had moisture issues and it was demonstrated that the machine could be used safely without any concern.
Problems Solved

The presented solution solves the following problems:

- Moisture issue on BU Strip heaters.
- Avoid circuit breakers trip
- Voltage arcs
- Installation fuse blown
- Customer / user safety
- Integrity of the machine
- Customer satisfaction
- Protection of heating technology usage
- Electrical regulations compliance
Description

Current build unit heating platform solutions use strip heaters to heat the surface while printing, as well as, to heat up the finished printed volume.

In wet or high moisture environments, such as during the shipment of units by vessel, improper packaging, stockage in distribution centers, customer facilities among others, the strip heaters will absorb the water from the environment making the resistance drop causing electrical arches or circuit breaking when voltage is on.

Once the strip heaters have absorbed water, this circumstance could compromise the user electrical safety, integration of the system, shut down of build unit components or customer installation fuses blown.

Typically for other components, the moisture would be removed by doing a heating up of the strip heaters directly with a power supply and heating them for some hours to remove the moisture inside. This is not possible once if the heaters are assembled in the build unit.

The solution covered in this disclosure, consists in an internal routine or method:

1. The build unit are build platform are moved to the on top position (whether is it at first unpackaged or after a printed job)
2. The build unit is inserted into the printer,
3. The printer will not power on the build unit at this stage
4. The printer’s heating system will start a routine to heat up the platform for a certain amount of time and remove the moisture from the strip heaters.
   After this period the water particles that are trapped in the electrical isolation made of MgO will be removed and the BU will be ready to be used safely.

The advantage of the proposed method is that this solution can be part of a software routine and use the current existing hardware on the printer side, avoiding extra tools to carry on during installation or maintenance.

Furthermore, this routine could be auto launched as a preventive check depending on the latest build unit connection by monitoring the serial number and latest connection time.
Advantages

- Avoid connect the Build Unit into the grid/Current under unsafe conditions
- Avoid external tooling.
- Routine can be automated in first start up or after certain time.
- Implementation can be done remotely (firmware strategy) and avoid engineers travelling on site.
- It is transparent for the customer/user
- Protects the HP heating technology in front of partners/users that may want to patent it.

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