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CALIBRATION OF SERVICE STATION HEIGHT ADJUSTMENT USING DROP DETECTOR

HP INC

Calibration of Service Station Height Adjustment using Drop Detector

Abstract: In a powder-based additive manufacturing, a technique to calibrate service station height at the customer site uses optical drop detection to indicate the direction in which the service station is to be moved to bring it into an acceptable position.

This disclosure relates to the field of additive manufacturing.

A technique is disclosed to calibrate service station (SVS) height at the customer site.

In 3D printers or other Additive Manufacturing technologies, parts are built by adding successive layers of material, in some cases a powder (plastic, metal or other composite materials) from a series of cross sections (layers), which stick to each other creating the body of the part being fabricated. In some systems these layers are formed on top of a moving platform, along a vertical axis. There is also a scan axis which drops some agents to fuse and define (fusing and detailing agent) the parts printed through this printing process involving powder, agents and temperature. To achieve high quality parts, several calibrations are performed during manufacturing side. One is the Service Station (SVS) height adjustment, which uses specific tooling in the factory to achieve the required accuracy. However, once a unit leaves the factory there is no calibration capability at the customer site.

According to the present disclosure, and as understood with reference to the Figure, a closed loop SVS height calibration process 10 utilizes feedback from drop detection measurements 20 to adjust the height of the SVS 30. The calibration procedure 10 diagnoses an improper service station height condition at a customer site, and provides feedback to a repair engineer to readjust the SVS 30 height without the need for the expensive and heavy equipment used at the factory to adjust the SVS 30 height.

In the calibration process 10, the height of the SVS 30 is first measured using drop detection 20. In some examples, an optical drop detector may be disposed in the service station 30. During calibration, a printhead 40 ("pen") is held in a fixed position and sequentially fires the nozzles of a specific die at a particular firing rate (e.g. X drops are fired at Y kHz). The time necessary for one drop fired to cover the distance between the nozzle and the optical drop detector sensor is the "fly time". Based on the fly time, the SVS height is determined. If the printhead 40 is too close (condition "2") to the drop detector, for example, the fly time will be shorter than expected, and therefore drop detection will start and finish too late. In this case, the height of the service station is manually adjusted 50 (e.g. by the service technician) in the downward direction ("2") by the height of one step, and the drop detection process is repeated at 20. Conversely, if the printhead 40 is too far (condition "1") from the drop detection, the fly time will be longer than expected, and the height of the service station is manually adjusted 50 (e.g. by the service technician) in the upward direction ("1") by the height of one step.

This measurement and adjustment process 10 continues until the height of the SVS 30 has been adjusted such that drop detection 10 indicates that the service station 30 has been positioned such that SVS 30 height is within a predetermined range of acceptable heights.

The disclosed technique advantageously allows a service technician to run diagnostics for the SVS assembly. In another example, the 3D printer itself could automatically

diagnose the issue without the need for a service tech. No special tools are required for mechanical adjustment even if a large misadjustment of the service station height is found. Therefore diagnosis, repair and readjustment can happen in the same intervention, which reduces re-repairs and in turn the warranty cost of the printers.

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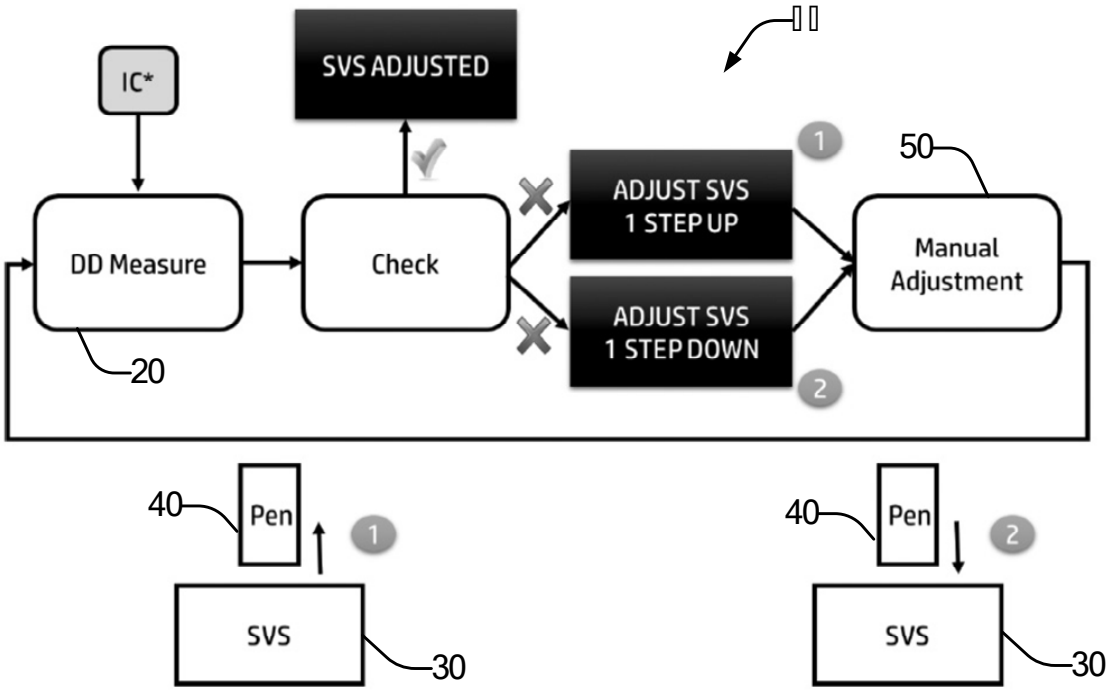
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