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METHOD AND APPARATUS FOR 3D PRINTER LEVELING ON IRREGULAR FLOORS

HP INC

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This disclosure relates to the field of leveling of 3D printing machines, where structures need to be leveled over irregular floors. If some cases, printer's structure will not provide sufficient structural stiffness to constrain printer's deformations within an admissible range, thus a leveling process that corrects this eventual lack of flatness will be required. Commonly used leveling procedures may be based either on geometrical condition measurements of specific printer's structural components or spatial position determination of printer's reference points, this last one typically using laser tracker instrumentation. These processes are typically either tedious or require the use of expensive equipment.

A mechanical solution is disclosed that allows for easier leveling process. It is based in the relation between deformation and reaction forces on an elastomeric material, as described by Hook's law. Since the reaction forces between each of the printer's foot and ground on a non-deformation state may be calculated knowing printer's mass and center of gravity coordinates, a device that monitors this reaction force at each foot will allow to determine how close to the optimal state a leveling is. Deformation of an elastomeric body assembled in series between foot and structure can be measured, then knowing the reaction force that the foot is applying at this time.

Hereafter, a description of a possible reaction force measuring device is described. In drawing 1, printer's foot (a) is resting on the floor (b), while printer's structure (c) is not resting on foot since there is a through hole in the structure where the foot crosses it (c.1), then reaction force in this foot is zero (it is assumed here that structure is laying on other three feet, otherwise the situation would be one between pictures 1 and 2).

In picture 2, spring (d) has been compressed by actuating nut (e) and washer (f) upwards, then pushing up printer's structure and increasing foot's reaction force through the compressions of the spring itself. Nut is actuated until compression of the spring reaches the nominal level determined by gauge (g).

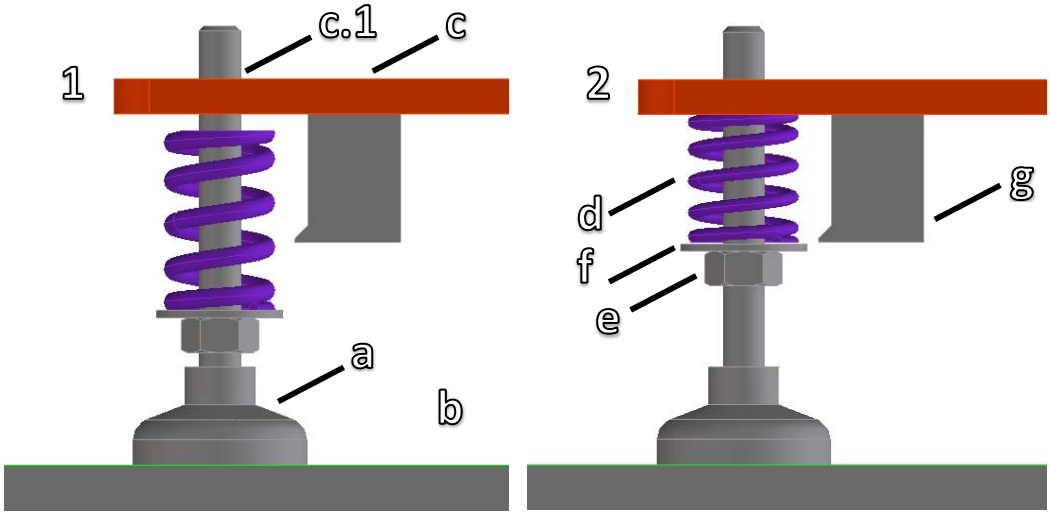

Figure 1 and 2 – Leveling foot embodiment

Notes:

- Process described before needs to be repeated in each foot and then repeated to compensate for the variations seen on the already adjusted feet. These cycles will need to be repeated until all spring reactions values fall within an accepted value range.
- Since presumably all feet will have different nominal reaction forces, each foot will require a different gauge (g) specific to its nominal reaction force.
- The described embodiment does not describe a locking mechanism to be actuated once all feet are adjusted. Solution will work but printer will be able to oscillate over the springs if vibrations or external loads are applied to the machine.

Disclosed by Pol Morral, Victor Ruiz and Sergi Culubret, HP Inc.