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ADJUSTMENT MECHANISM TO CALIBRATE THE ROLLER HEIGHT BY MEANS OF A DIFFERENTIAL SCREW

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Adjustment Mechanism to Calibrate the Roller Height by Means of a Differential Screw

Abstract

On an additive manufacturing 3D printer, parts are constructed by forming thin layers of pulverized material and selectively melting or binding it.

To have a good part quality it is important to control the distance between the print heads and the powder bed surface. It can be achieved by calibrating the height of the roller with respect the print head carriage with a proper mechanism.

In this article, a mechanism is described to precisely calibrate the height of the roller by means of a differential screw combined with a lever to ensure adjustment is fine enough.

Description

On an additive manufacturing 3D printer, parts are constructed by forming thin layers of pulverized material and selectively melting or binding it.

The printing process starts spreading raw powder on the surface of the print area until having the printing zone covered by a thin layer of powder. Then binding or fusing agent is jetted at precise locations on to the powder bed to define the geometry of the single or multiple parts that wants to be printed. Then, an energy source helps evaporate liquid components and cure the material. This process is repeated until the part or parts are formed.

To have a good part quality it is important to control the distance between the print heads and the powder bed surface. It can be achieved by calibrating the height of the powder spreading roller with respect the print head carriage with a proper mechanism.

The solution described here consists of a differential screw with two different thread sizes and a pivoting lever. As shown on Figure 1, the differential screw is connecting the pivoting adjusting lever to the housing at the opposite side of the pivoting point. When the screw is moved one turn the lever is separated from the housing by the difference of the two thread pitches. For instance, if M5x0.8 and M4x0.7 are used, at each turn lever will separate 0.1mm. As the screw is at one end of the pivoting point and roller being adjusted at the middle point, it means that in the above example it will move about half the lever separation, i.e., 0.05mm. note that this will depend on the final lever ratio used.

Pivoting point can be either a real pivoting pin or axle or just the flexibility of the lever. This can be improved by designing it with a narrowing on the lever as shown on Figure 1.

Bearing on the roller is preload against the lever to ensure its contact. This also provides extra load on the mechanism to ensure differential screw has enough friction force to prevent from unscrewing.

A vertical wall on the housing can be used to reference the roller to ensure the proper center to center distance on the transmission while leaving free the vertical movement. This is shown on Figure 2 on a top view cross section of the mechanism.

Alternatively, roller bearing could be referenced in both directions on the adjusting lever as shown on Figure 3. In this example, the two contact pads forms a V-shape and the pusher is kept vertical. In this case, a parallel axis transmission is used. In order to keep the centre-to-centre distance between gears constant, the pinion is aligned with lever pivoting point so that when mechanism rotates during the adjustment such distance keeps constant.

In summary, this simple adjusting mechanism provides a good adjustment resolution and feeling without any bouncing back. Moreover, as system is inherently pre-loaded there is no need of any other element to secure the adjustment once applied. Differential screw keeps the adjustment locked at any time.

1. Figures

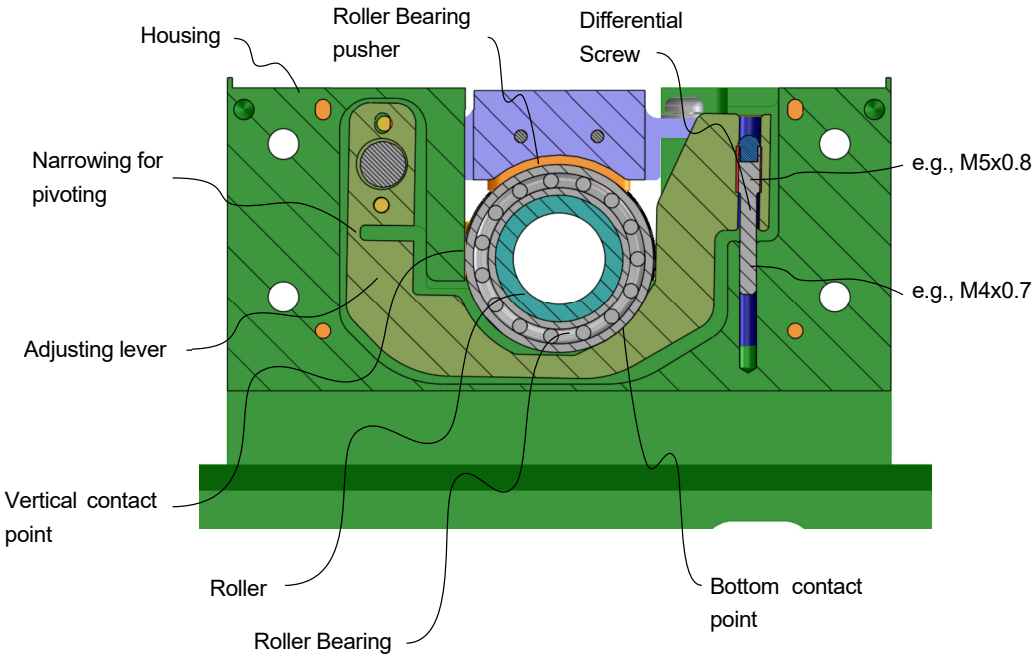

Figure 1

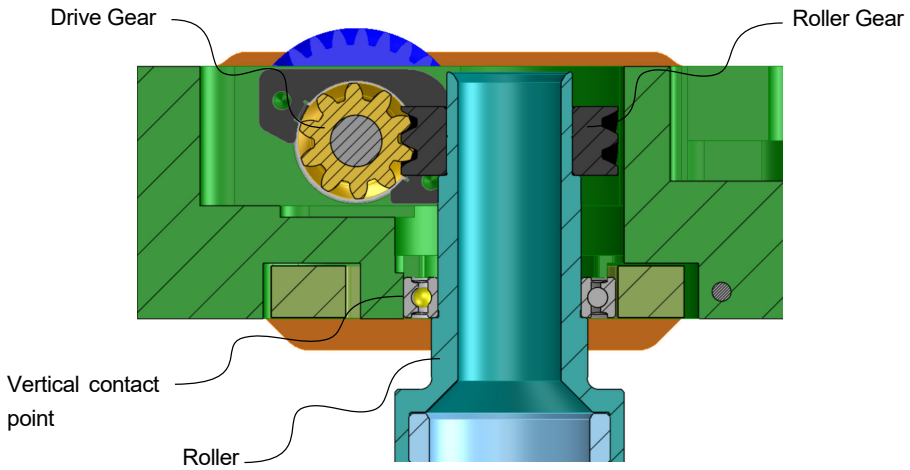

Figure 2

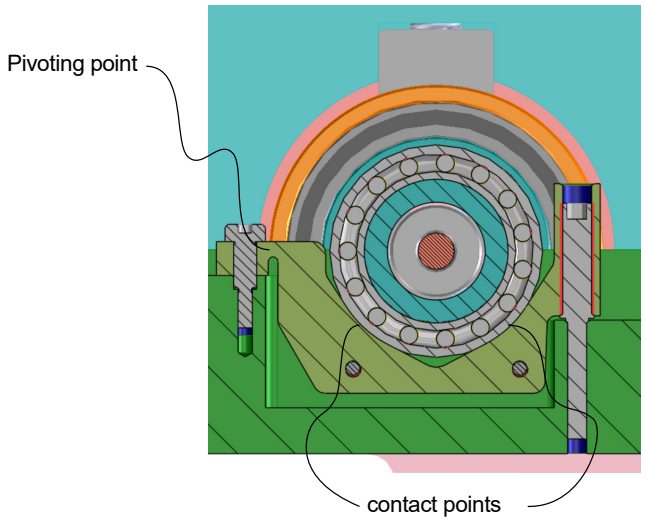

Figure 3

Disclosed by Dani Gonzàlez, HP Inc.