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ARCHIMEDES AUTO CLEANING SYSTEM

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Archimedes Auto Cleaning System

Overview of the system

In the 3D system, before printing, powder must be lifted from the powder supply located inside the Build Unit up to the powder feeding area. To perform this lifting function, a system of two Archimedes screws enclosed in aluminum extruded tubes rotates to transport the powder up to the feeding area.

With the introduction of new materials and the option of switching from one to another, it is important to guarantee that the system is clean from the previous material before loading the new one to ensure quality and that the printed parts will have the expected mechanical properties.

The inner surface of the tubes that enclose the Archimedes screws are always coated with powder that gets stacked during transportation, so this surface represents a critical area to be cleaned to avoid material mixing.

Currently the process used to clean is to use brush, and manually insert it in the tubes after removing the Archimedes screws. By moving it up and down while rotating it, the tube is supposed to be cleaned.

This disclosure is to present a system that would automatically clean the powder inside the tubes when material swap is required. This system would increase cleaning process robustness and reliability as well as reduce machine down-time since no human intervention would be required.

Which are the problems that this system solves?

The solution solves the following problems:

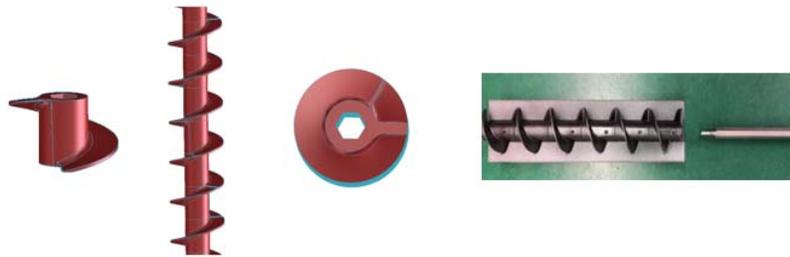
- Eliminates the risk of incorrect cleaning due to human factors
- Guarantees repetitiveness and robustness in cleaning process
- Reduces time of powder change process which leads to reduced unit down-time
- Reduces risk of cross contamination of 2 different materials when the user wants to switch materials

How does the systems work?

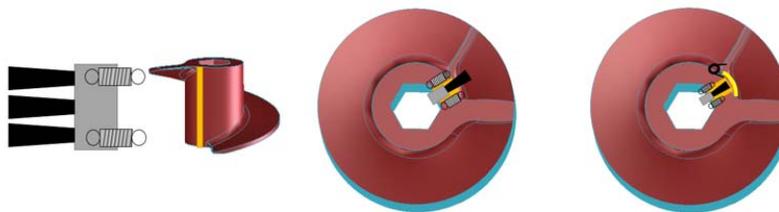
Disclosure to explain a system that can automatically clean the inner surface of Archimedes screws, critical area to be cleaned to enable proper material swap in relevant 3D printing Systems.

To clean the tube in an efficient way, this system would take advantage of a spring-based brushes that would be allocated inside the helicoidal modules present in the Archimedes screw. When required to clean, the system would pop out the brushes to clean the tube while rotating.

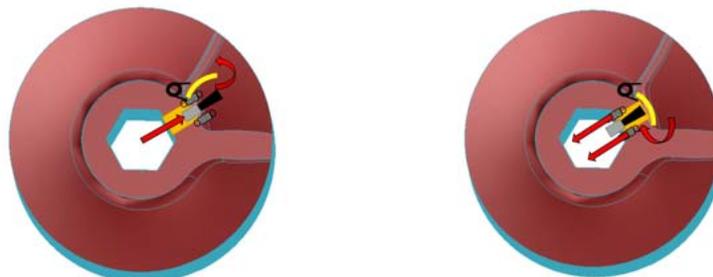
Current Archimedes system is made with helicoidal plastic modules that are installed in a hexagonal hollow shaft:



The proposed solution would take advantage of these helicoidal modules flat faces to install a spring-based brushes system inside. Besides, in order to guarantee that brushes do not get dirty of powder losing hence cleaning efficiency, a spring-based door will cover the brushes from powder while cleaning not required:



With the above hardware configuration, it would be possible to enable cleaning when required by pushing the brushes out. When pushed out, the brushes will open the powder cover door contacting then desired surface that needs to be cleaned. At this point brushes would remain out and Archimedes system would start rotating, enabling the brushes to clean the full inner surface. Once no cleaning required, brushes would be released back to original position thanks to the springs, same as powder cover door would do:

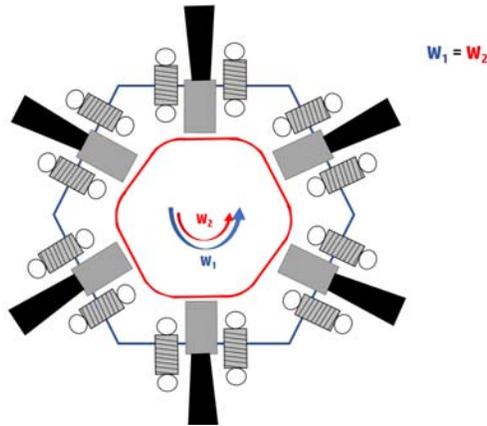


Cleaning start

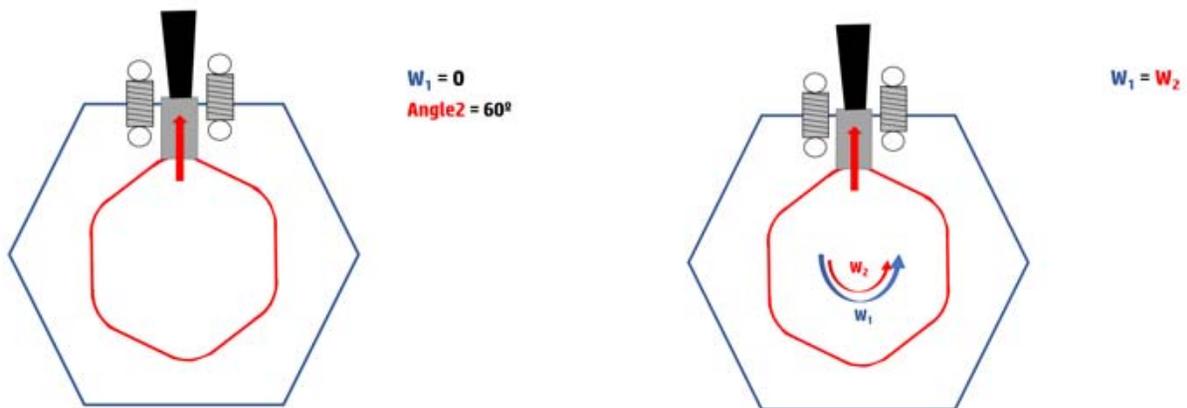
Cleaning end

The system in charge of popping the brushes out would be an inner shaft located inside the main hollow shaft that retains the helicoidal modules. This shaft would have hexagonal shape too, and would have its faces parallel to main shaft while not cleaning and 60° of difference while cleaning.

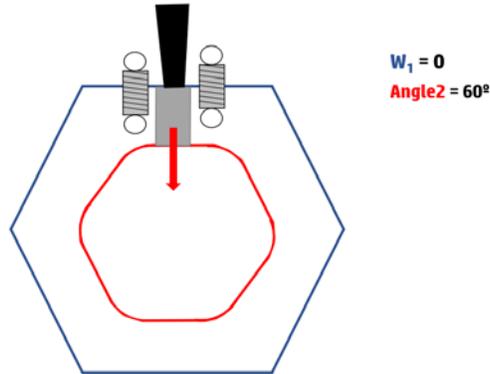
Below picture represents the two shafts configuration when no cleaning is required. Hexagons faces are parallel and rotate at the same speed, not popping the brushes out:



When cleaning is required, the inner shaft would rotate 60° while the main shaft remains stopped. This rotation would make the inner shaft act as a lever, pushing the brushes out to cleaning position. When this position is reached, the two shafts would start rotating again at the same speed enabling the brushes to clean the full surface of the Archimedes tubes:



When cleaning operation is already performed, the inner shaft would rotate again 60° while the main shaft remains stopped, allowing the springs to bring the brushes back, closing the powder cover door and returning the system to original non-cleaning configuration:



Which are the advantages on doing in this way?

- No need to dismantle printer parts for cleaning
- Minimize customer cleaning trainings
- Minimize risk of poor cleaning quality
- Minimize risk of material mixing thermal issues
- Minimize the risk of having Part Quality issues
- Minimize risk of having raised parts
- Minimize machine down-time for material swap

Are in the market other kind of solutions?

In the market there are no current specific solutions that can perform this cleaning process without needing to remove the screw from inside the tube where it is allocated.

Disclosed by Guillermo Moliner, Eduard Galdeano and Alejandro Torres Pinero, HP Inc.