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REMOVABLE AUGER FOR 3D PRINTING TO ALLOW A DEEP CLEAN FOR CHANGING THE PRINTING MATERIAL

HP INC

Title: Removable auger for 3D printing to allow a deep clean for changing the printing material

This disclosure relates to the field of 3D printing machines using plastic or metallic powder to build parts, like powder bed fusion or binder jetting processes. The automation of these processes requires moving the powder from the supplies to the printable area. One of the most reliable ways to convey or lift powder is using an Archimedes screw that is located inside a tube. A problem occurs when the Archimedes screw should be cleaned, for example, for changing the printing material. The Archimedes screw is usually long and should be removed through one of the sides of the tube. On the other side there's the transmission shaft that provides torque to the Archimedes screw, that difficult the extraction of the Archimedes screw.

A mechanical system is disclosed that allows an easy disassembly of the Archimedes screw to clean manually the external surface of the helixes and the internal surface of the tube. The Archimedes screw can be detached from the transmission shaft using a coupling provided with flat planes to transmit the torque and a long rod with a threaded end that goes through the Archimedes screw to retain it axially. The transmission shaft should also be provided with flat planes and an internal thread to engage the Archimedes screw. The long rod can be rotated independently from the Archimedes screw using a hollow shaft that supports the helixes. This long rod can be removed independently from the Archimedes screw or captive with the Archimedes screw by using a pin or a machined protrusion at the bottom or top of the rod. The use of O-rings and flat interfaces between the helixes prevents the powder to fill the internal gaps of the Archimedes screw assembly, avoiding stagnant powder and the need to clean these surfaces and cavities. To ensure the contact between the different helix modules a compression spring or similar device should be used. An example of an Archimedes screw with these features is shown in Figure 1 **and** Figure 2**.**

The only operations required to remove the Archimedes screw in the described mechanical system are: unscrew the long-threaded rod and pull the Archimedes screw outside the tube. The Archimedes screw can be removed also when the tube it's full of powder. To assemble the screw, it's required to have the tube and the transmission shaft free of powder. The operations required to assemble again the Archimedes screw are: place the Archimedes screw inside the tube and screw the long-threaded rod to the transmission shaft.

The main advantage of using a long-threaded rod to fix the Archimedes screw assembly to the transmission shaft is that it can be disassembled easily having access only to the Outlet of the Archimedes screw. In many cases, the motor of the Archimedes screw is placed in the Inlet side of the Archimedes, this area should be sealed and is usually provided with covers resulting in a complex access for the user.

Another advantage of using a threaded union between the Archimedes screw and the transmission shaft is that no retainer is needed in the outlet or exit of the Archimedes. If a sheet metal or any other part is placed at the outlet of the Archimedes screw could lead into powder compaction that can potentially block the Archimedes, create powder agglomerations or reduce the efficiency of the Archimedes screw.

As mentioned previously, the Archimedes assembly once it's removed should be cleaned on the external surfaces only. The internal gaps between the rod and the extrusion or the helixes and the extrusion or the compression spring cavity can be sealed using O-rings or flat interfaces. This avoids the user to disassemble all the parts minimizing the time required for this operation and the possibility of a bad assembly after the cleaning.

In Archimedes screws that are not removable or are very complicated to remove it's needed to circulate sacrificial material that should be disposed after the cleaning operation to avoid contamination between

different materials. The use of sacrificial material can't guarantee that there's some material remaining attached to the helixes or tube that can eventually fall later in operating conditions and affecting the part quality of the printed parts. Avoiding the use of sacrificial material to clean the Archimedes screw it's also more economic specially when using expensive powder materials.

DRAWINGS:

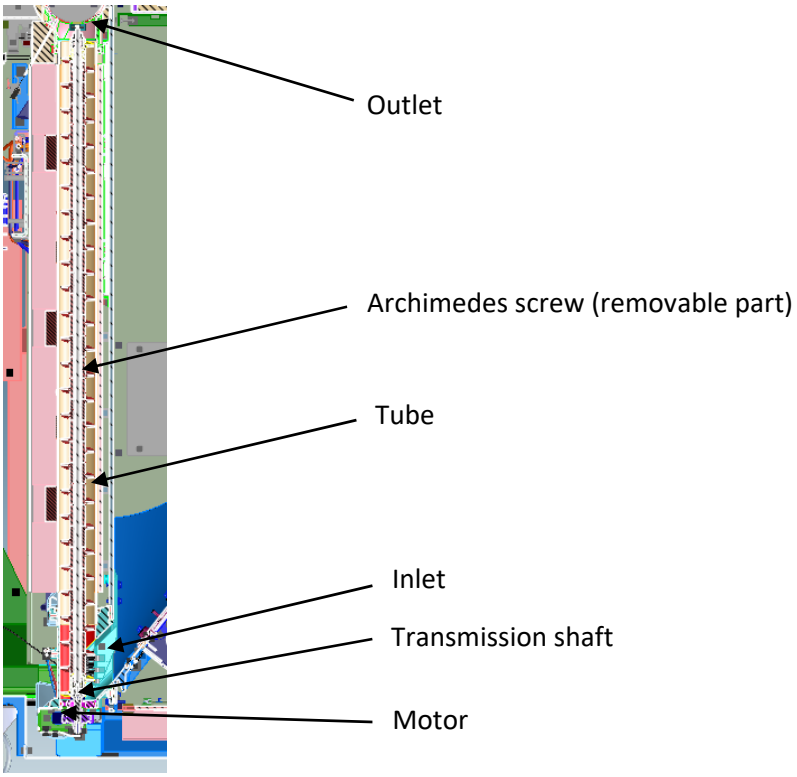

Figure 1 Main Archimedes screw parts.

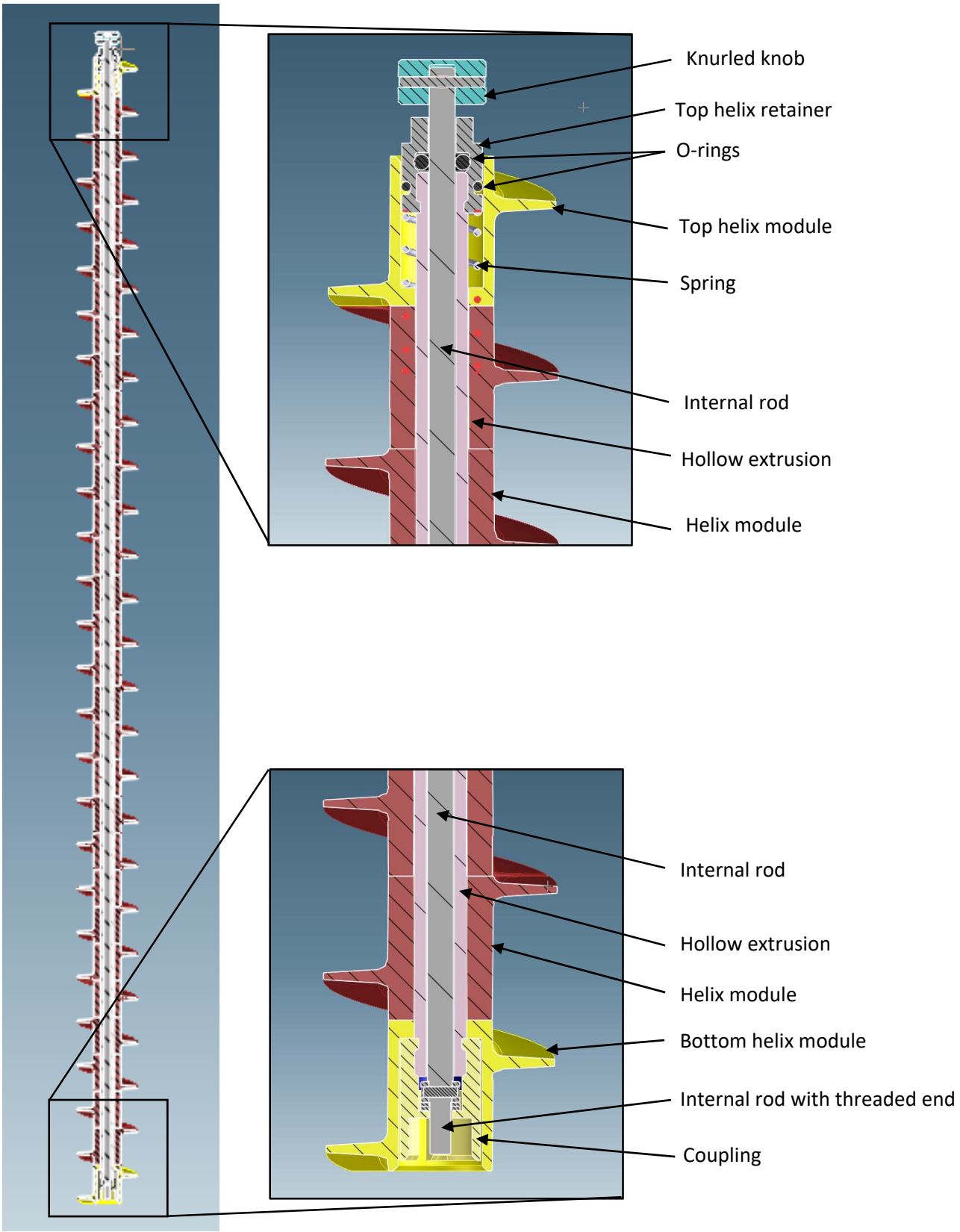

Figure 2 Archimedes screw details (removable part).

Disclosed by Joan Mach, Gerard Mosquera & Pau Martin, HP Inc.