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February 2020

PROCESS TO LOAD A FILTER WITH RELIABLE SEALING

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Recommended Citation

INC, HP, "PROCESS TO LOAD A FILTER WITH RELIABLE SEALING", Technical Disclosure Commons, (February 07, 2020)

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Process to Load a Filter with Reliable Sealing

Abstract

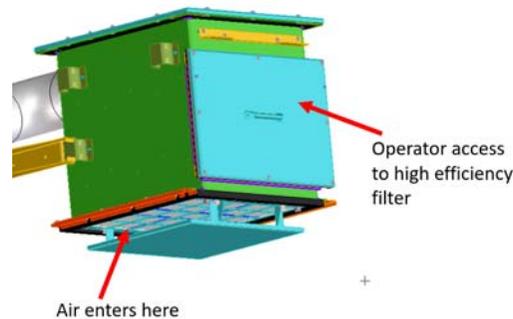
Here is disclosed a process of loading the high efficiency filter in the most ergonomic possible manner and using the existing user access direction (main door of print chamber) to further save space allocated for access. A handle is pressed after loading the filter to activate the expansion of a system which pushes the filter upwards, hence closing its seal against the filter housing. The system works to take a horizontal force from the user and express it as a purely vertical force to the filter. This maintains filter positioning and minimizes risk of damaging the seal.

To raise and seal the filter, a handle must be pressed into the filter housing. Only when this is done is it possible to close the filter housing door, hence functioning as a mechanical fail-safe of the system.

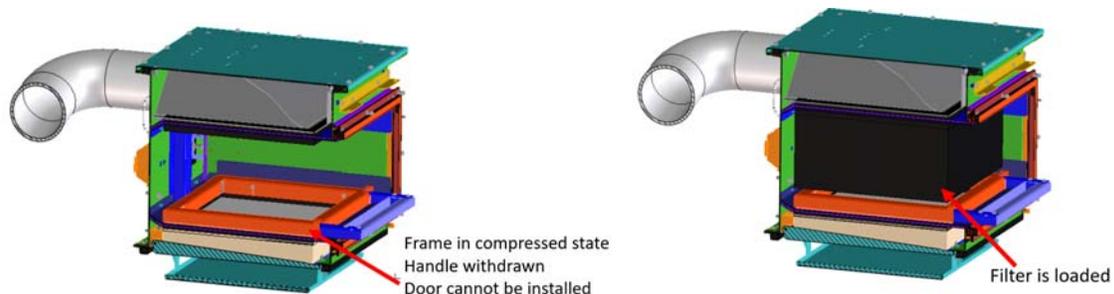
Publication

It is critical to make reliable and repeatable sealing of high efficiency filters installed in the exhaust in the case of metals printing where the powder is hazardous. Typically, these filters are large and difficult to handle and install – especially when designing for the 95 percentile of people’s body sizes. This invention is a process that is designed to allow easy access to the filter and seals it correctly in a reliable, repeatable and fail-safe way

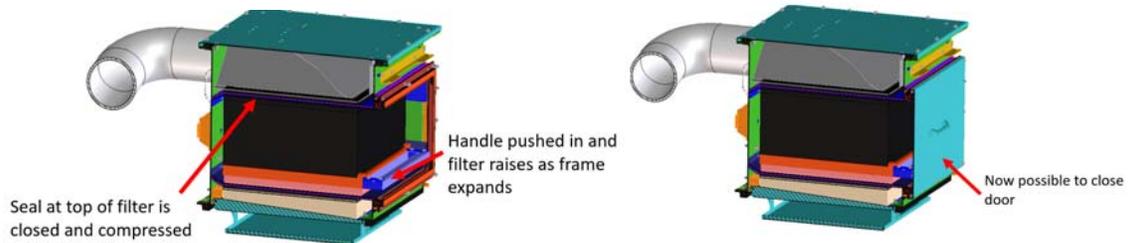
The high efficiency panel filter filters particles down to 0.3 um at 99.9% efficiency and the seal between it and the housing must match this. The filter is large (even though it is comparatively space efficient) and therefore must be loaded perpendicularly to the sealing/airflow direction – if not, there would be no space for it to enter the housing as other subsystems would be in the way. This is also the most comfortable loading direction for the operator.



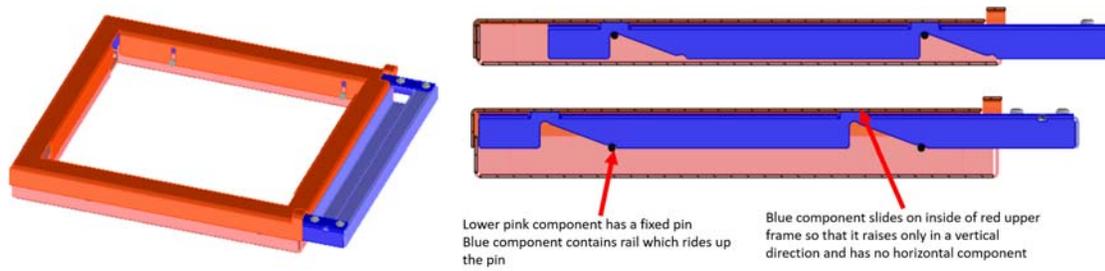
The filter is loaded onto an expandable frame. The frame uses an internal rail system so that it can raise the filter to compress the seal between the filter and housing in a repeatable and reliable way. The frame is operated by a handle that can be pressed horizontally inwards by the user but is designed in such a way that the movement of the filter is purely vertical. This vertical movement compresses the foam seal without creating any shear stresses with the potential to cause damage to the filter seal.



When the frame is in its compressed state, it is not possible to close the door of the filter housing. This is a mechanical fail-safe design so that the machine cannot be operated without the filter in the sealed state. When the frame is in the compressed state, the handle has been pushed inside the filter housing box and therefore does not interfere with the installation of the box's door.



The frame has been designed to be easily removable from the system for cleaning or other maintenance activities. Below is a detailed look at how the expanding frame mechanism functions



There is a small 'sink' for the pin to sit and be held in at the expanded and compressed state. This stops the frame from changing state from expanded to compressed without an operator's input.

The system is incredibly space efficient compared to other high efficiency filtration systems seen on competitor 3D printers. The expanding frame has only two possible states of rest – fully expanded or fully compressed. Therefore, the installation of the filter can be reliably and repeatably done by any operator.

Disclosed by Rhys Mansell, Mohammad Jowkar, Jorge Diosdado, HP Inc.