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# High Temperature Nozzle Shield

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**Title: High Temperature Nozzle Shield**

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Abstract: This publication relates to a nozzle shield for shielding the nozzle of a print head. This nozzle shield has both a mechanical and a thermal functionality.

In present FFF devices, such as printers manufactured by Ultimaker® (see e.g. Ultimaker S5), the print head is provided with a nozzle shield to prevent print material from creeping up along the nozzle(s). This shield is made out of silicone which makes the shield flexible, but it is also limited to a temperature of about 260 °C. Above that temperature, the silicone degrades and the nozzle shield is not properly functioning and often needs to be replaced.

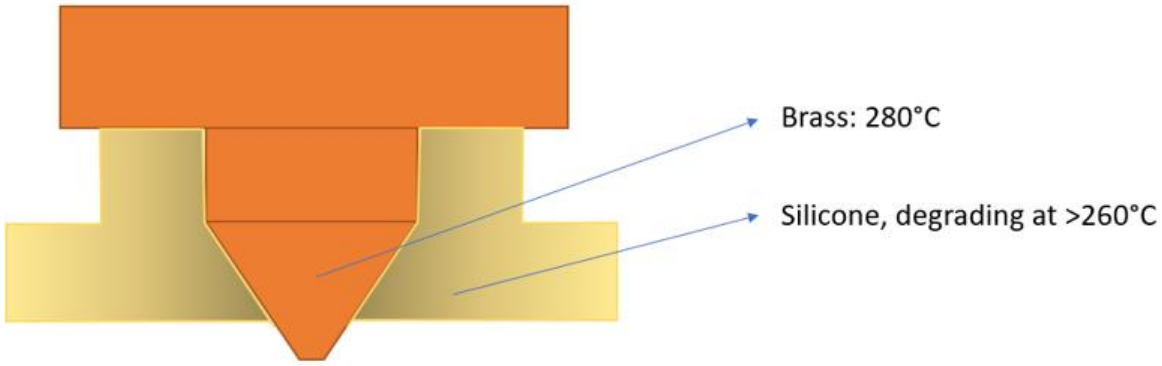


FIG. 1 State of the art nozzle shield

We now propose to use a combination of woven high temperature material (carbon fiber, glass fiber, other silicate fibers …) to form a very high temperature resistant layer that touches the nozzle and isolates the heat, see FIG. 2 below. Silicone is still used for the rest of the cover. The woven material can be directly applied to the silicone, preferably during molding.

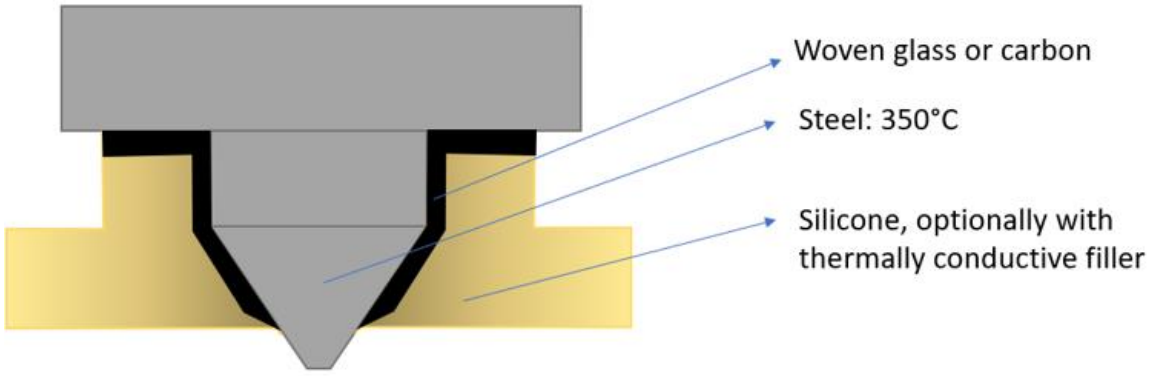


FIG. 2 proposed solution including temperature resistant layer

The solution allows for nozzle temperatures well over the degradation temperature of silicone.

The combination of materials shown in FIG. 2 would fit all requirements for a nozzle shield for Ultimaker® (and many other manufacturers):

- It is flexible, so it will move up and down when switching nozzles, when it is also connected to the printhead to shield heat and not leave any gaps;
- Only the silicone is exposed to the print and to ooze, 3d printed material will not stick to it;
- The nozzle will not degrade the silicone cover as the woven material is very temperature resistant and insulating.

Advantages of the proposed solution are listed below.

- The solution is flexible to tightly fit the nozzle and handle nozzle switching/movement
- The solution is resistant to high (>>300°C) temperatures
- The solution protects the printhead from molten plastic sticking to it (flooded printheads)
- This solution also insulates the nozzle tip. This helps from reducing cooling by the print cooling fans.

It is noted that if the thermal conduction of silicone is not high enough to get rid of the heat creeping through the woven material, a thermally conductive filler can be added.