



3D Hybrid Metal Prototyping Device

Product:

3D Hybrid Metal
Prototyping Device

Development Stage:

Prototype Tested

Primary Inventor:

Pavel Ikononov

Scientific Publication: None**License Status:**

Available for licensing

Patent Status: US Patent

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At present, the majority of 3D prototyping technologies (Additive Manufacturing - AM) have been developed around thermoplastics. While there are many options for creating AM plastic parts, 3D metal prototyping is limited to parts for expensive equipment and is utilized mainly by large industries, like the jet

propulsion industry. The high cost of metal AM devices for prototype or replacement parts prevents most users from accessing the technology.

Certain manufacturers have made notable progress with AM for metal parts and have come to view it as an extremely useful process. However, the metal parts created by commercial 3D metal prototyping devices can lack precision and durability and their creation requires significant user interaction with the device as it runs. These characteristics make the technology unsuitable for many applications.

AM for metal parts commonly involves laser sintering of metal particles form a single layer of the 3D structure. The sintering is sometimes followed by machining of the sintered layer. This metal AM process requires high power consumption, expensive particle metal, and dedicated maintenance for and interaction with the AM device. The part also can require finishing steps to remove surface imperfections.

Technology Description

Researchers at WMU have developed an improved method of metal AM by combining the use of welding technology,

instead of sintering of a metal powder, with a subtractive/machining process (Computer Numerical Controlled Machining - CNC) to create metal parts with unmatched complexity, precision, and quality.

First a weld form layer is built, followed by 5-axis machining of the layer. This process is repeated to produce a complete metal part. Unlike CNC machining of cast or forged parts, this metal prototyping device has complete access to all surfaces of the metal part as each layer is welded/built. This improves machining performance and part tolerances. The rotational speed of the CNC machining is slower, reducing device downtime and maintenance costs. A test part created by this AM device exhibited excellent tolerances and a complete lack of cracks found in parts made by metal sintering. The 3D Hybrid Metal Prototyping Device has a low, initial machine cost and a low build cost, using welding wire instead of metal powder, allowing for inexpensive, large lot production of fully functional metal parts.

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Potential Benefits

- Complex metal parts are produced with high tolerances and no imperfections
- The machine cost and build cost is low for affordable, large lot production
- Low speed machining uses less power and reduces maintenance costs and downtime