sponge material can be mixed with alloying elements and formed into a wire where it may be used in an SFFF process in combination with a plasma welding torch or other high power energy beam to produce near net shaped titanium components.

[0009] Abbott *et al*. (WO 2006/133034, 2006) describes a direct metal deposition process using a laser/arc hybrid process to manufacture complex three-dimensional shapes comprising the steps of providing a substrate and depositing a first molten metal layer on the substrate from a metal feedstock using laser radiation and an electric arc. The electric arc can be provided by gas metal arc welding torch using the metal feedstock as an electrode. Abbott *et al*. teaches that the use of laser radiation in combination with gas metal arc welding stabilizes the arc and purportedly provides higher processing rates. Abbott *et al*. utilizes a consumable electrode guided by and exiting out of a wire guide. The metal of the consumable electrode is melted at the end and the molten metal is deposited by positioning the end over the deposition point. The required heat for melting the consumable electrode can be supplied by an electric arc expanding between the tip of the electrode and the workpiece/deposition substrate, and by a laser irradiating the deposition area. Welding by melting a consumable electrode heated by an electric arc is known as gas metal arc welding (GMAW), of which in the case of using non-reactive gases to make the arc is also denoted as metal inert gas welding (MIG-welding).

[0010] In order to effectively deposit metal from a metal wire unto the surface of a work piece using a welding torch, it is necessary to maintain the metal wire in the correct position relative to the welding torch. If the metal wire is not maintained within the arc, it will not melt properly or be deposited in the correct position.

[0011] Accordingly, there exists a need in this art for an economical method of performing direct metal deposition at an increased rate of metal deposition while maintaining

the metal wire in the proper position within the arc of the welding torch.

[0012] **SUMMARY**

[0012a] In an aspect, the present disclosure refers to a metal wire positioning system, comprising:

a main frame;

a plate containing an internally threaded opening, the plate fixedly attached to the main frame;

a holding unit attached to the main frame, the holding unit comprising a rotatable support piston engaged with a pivot joint, and a connector connected to the rotatable support piston and pivotably supporting the rotatable support piston;

an adjustable guide support frame rotatably connected to the main frame by the holding unit via the pivot joint and suspended by the rotatable support piston;

a wire guide attached to the adjustable guide support frame;

a motor attached to the adjustable guide support frame, the motor attached to a threaded member that is engaged with the internally threaded opening in the plate such that the adjustable guide support frame is repositioned toward or away from the main frame in response to a rotation of the threaded member; and

a detector that detects the position of an arc of welding torch.

[0013] An example provides a system for delivery of metal wire to a welding torch and to maintain the metal wire in the heat source emitted by the welding torch, such as the arc of a plasma arc welding torch, for building metallic objects by solid freeform fabrication. The welding torch includes a heat source, such as a plasma