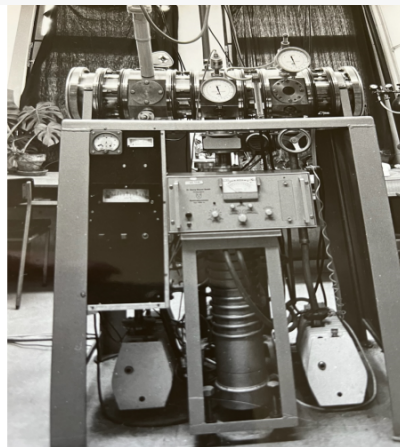


High Power Plasma Electron Beam Installations Deliver Advanced Heat Treatment and Material Processing Capabilities

PITTSBURGH, PA, UNITED STATES, August 22, 2025 /EINPresswire.com/ -- Elena A. of Hanover, MD is the creator of High-Power Plasma Electron Beam Installations, a versatile and innovative solution for industrial heat treatment, welding, casting, and surface engineering applications. Designed around a high-power plasma electron source, the system enables rapid, precise, and versatile thermal processing across a wide spectrum of materials, including, but not limited to, metals, alloys, dielectrics, ceramics, glass, and insulators.

Unlike conventional thermionic electron guns, lasers that require supplementary electric and magnetic fields or optics for beam control, this system employs a hollow cathode to generate a plasma and powerful electron beams with customizable thermal profiles. By eliminating complex auxiliary systems to control the beam and introducing configurable cathode structures, the system achieves efficient beam control, highest energy efficiency (>80%), and enhanced adaptability for the most complex manufacturing technologies like additive manufacturing and 3D printing.

Key applications include the melting and casting of hard fusible alloys, ultra-fast surface heat treatment of steels, single-shot welding of dissimilar metals, deposition of thin films, and additive manufacturing (AM). This new system also addresses the critical limitations of current technologies. The ability to tailor thermal distributions, ranging from circular and linear to pinpoint profiles and possibility to have one-shot full layer treatment offers engineers precise control over microstructural properties. This ultimately results in eliminating residual, thermal



stress, porosity, cracks, balling, delamination, improving wear resistance, hardness, microstructure and quality of treated components.

Key features and benefits include:

- Hollow Cathode Electron Beam Source: eliminates the need for external electric and magnetic control fields or adaptive optics (lens, mirrors) to simplify operation and reduce system complexity.
- Versatile Thermal Profiles: produces cylindrical, circular, linear, or pinpoint heating distributions for precision-tailored treatments.
- Broad Material Compatibility: processes metals, alloys, dielectrics, ceramics, glass, and insulating materials with high efficiency.
- Superior Surface Properties: enhance hardness, fatigue life, microstructure and wear resistance of critical components such as turbine blades, landing gear, and structural elements.
- Efficient and Rapid Processing: enables ultrafast, one-shot (no scanning), annealing, refining, hardening, welding, melting and thin layer deposition with minimal distortion or residual stress.

When conventional thermal treatments (thermionic electron beam and laser) are used instead of plasma electron beam methods, industries face challenges such as longer processing times, higher residual stress, reduced wear resistance, poor surface quality, delamination, cracking, porosity and contamination. This system directly addresses these issues to provide an environmentally efficient, scalable, and economically advantageous solution for advanced manufacturing and surface engineering.

Elena filed her Utility Patent with the United States Patent and Trademark Office (USPTO) and is working closely with [InventionHome](#), a leading invention licensing firm, to sell or license the patent rights to her High Power Plasma Electron Beam Installations system(s). Ideal licensing candidates would be U.S. based product manufacturers or distributors looking to further develop and distribute this product innovation.

Companies interested in High Power Plasma Electron Beam Installations can contact InventionHome at member@inventionhome.com. Inventors currently looking for assistance in patenting, marketing, or licensing their invention can request information from InventionHome at info@inventionhome.com or by calling 1-866-844-6512.

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