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(54) **ULTRAMINIATURE BROADBAND LIGHT SOURCE WITH SPIRAL SHAPED FILAMENT**

(75) Inventors: **Margaret L. Tuma**, Strongsville, OH (US); **Joseph S. Collura**, Lakewood, OH (US); **Henry Helvajian**, Pasadena, CA (US); **Michael D. Pocha**, Livermore, CA (US); **Glenn A. Meyer**, Danville, CA (US); **Charles F. McConaghy**, Livermore, CA (US); **Barry L. Olsen**, Oakdale, CA (US); **William W Hansen**, Lakewood, CA (US)

(73) Assignee: **The United States of America as Represented by the Administrator of National Aeronautics and Space Administration**, Washington, DC (US)

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(58) **Field of Classification Search** 313/631, 313/326, 331, 333, 341, 344
See application file for complete search history.

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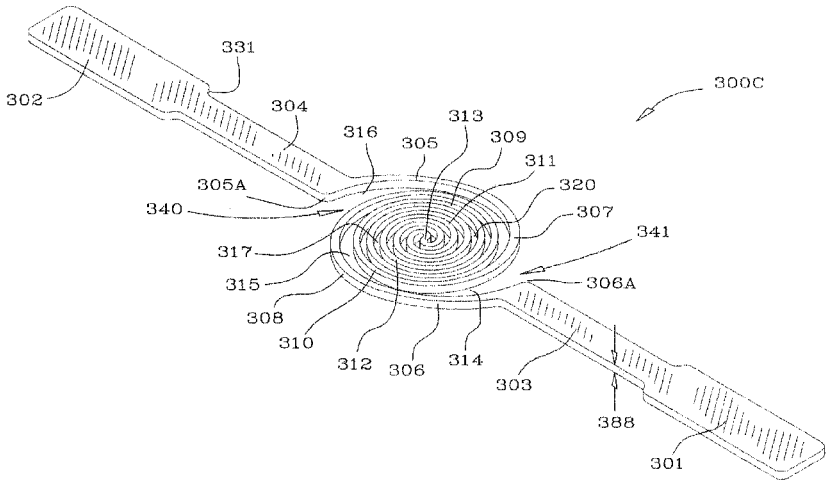
Primary Examiner — Anne Hines
Assistant Examiner — Jacob R Stern
(74) *Attorney, Agent, or Firm* — Robert H. Earp, III

(57) **ABSTRACT**

An ultraminiature light source using a double-spiral shaped tungsten filament includes end contact portions which are separated to allow for radial and length-wise unwinding of the spiral. The double-spiral filament is spaced relatively far apart at the end portions thereof so that contact between portions of the filament upon expansion is avoided. The light source is made by fabricating a double-spiral ultraminiature tungsten filament from tungsten foil and housing the filament in a ceramic package having a reflective bottom and a well wherein the filament is suspended. A vacuum furnace brazing process attaches the filament to contacts of the ceramic package. Finally, a cover with a transparent window is attached onto the top of the ceramic package by solder reflow in a second vacuum furnace process to form a complete hermetically sealed package.

10 Claims, 21 Drawing Sheets