(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 073 814 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication of patent specification: **08.01.86**

(21) Application number: **82901088.3**

(22) Date of filing: **01.03.82**

(86) International application number: **PCT/US82/00249**

(87) International publication number: **WO 82/03138 16.09.82 Gazette 82/22**

(51) Int. Cl.[4]: **H 01 J 1/15,** H 01 J 19/08, H 01 K 1/14, H 01 K 1/08, H 01 J 1/16, H 01 J 19/10

(54) ALLOY WIRE FOR LAMP COMPONENTS AND LAMPS INCORPORATING SAME.

(30) Priority: **09.03.81 US 241959**

(43) Date of publication of application: **16.03.83 Bulletin 83/11**

(45) Publication of the grant of the patent: **08.01.86 Bulletin 86/02**

(84) Designated Contracting States: **BE DE FR GB NL SE**

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Courier Press, Leamington Spa, England.

Description

Background of the invention

The present invention relates to alloy wire, lamp components made therefrom and lamps incorporating the components.

U.S. patent 1,602,526 to Gero describes the doping of tungsten oxide powders with potassium to promote a recrystallized structure having elongated interlocking crystals.

U.S. patent 3,236,699 to Pugh et al relates to a tungsten alloy doped with potassium and silicon in the form of a filament having good ductile properties and sag resistance in the recrystallized state.

U.S. patent 3,748,519 to Martin et al relates to supports for tungsten filaments and gettering. An alloy disclosed therein includes 92.5 percent tantalum and 0.5 tungsten.

U.S. patent 1,508,241 to Pacz describes a non-sag filament which uses oxides of tantalum or niobium as dopants in place of sodium potassium silicates to produce a non-sag filament.

U.S.—patent 3 346 761 to Ackermann describes a tungsten wire into whose surface layer tantalum is diffused serving as a getter.

Summary of the invention

The alloy wire composition of the present invention has metallurgical properties which permit its use as various components in various types of lamps. The metallurgical properties vary depending on the method of manufacture and use. The alloy wire may be used as a non-sag filament, a vibration resistant filament, a filament support or gettering means.

In accordance with the present invention, there is provided an alloy wire consisting of a single phase solid solution of tungsten and 0.2 to 6 percent by weight tantalum, said alloy including grain controlling additives uniformly distributed therein, said additives consisting of from 30 to 200 parts per million potassium and less than 100 parts per million silicon.

There is also provided a filament for an incandescent lamp, an incandescent lamp and method for making the alloy wire. The stability of the fine grain structure at temperatures up to at least 2200 degrees centigrade make it suitable for use in incandescent lamps requiring a vibration resistance filament. The recrystallized structure having elongated grains, is suitable for use in high temperature lamps requiring a sag resistance filament. Due to the inclusion of tantalum the alloy of the present invention has properties which make it suitable for use as a gettering component in lamps, such as tungsten-halogen lamps.

Brief description of drawings

Figure 1 illustrates an incandescent lamp.

Figure 2 shows cross section of grain characteristics conventional tungsten wire annealed at 2300C.

Figure 3 shows cross section of the grain characteristics of an alloy wire of the present invention annealed at 2300C.

Detailed description

The alloy of the present invention consists of tungsten and from 0.2 to 6 percent by weight tantalum. More preferably tantalum is present in an amount from about 1 to about 4 percent by weight based on total weight of the alloy. The alloy is intentionally doped with grain controlling additive to promote the formation of a favorable grain structure. The additives are preferably present in amounts less than about 300 parts per million and consist essentially of from about 20 to about 200 parts per million potassium and less than about 100 parts per million silicon. Silicon is present primarily to aid in the retention of potassium during processing. It has been found that potassium is more preferably present in an amount from about 30 to about 100 parts per million based on the weight of the final alloy composition.

Minor impurities may deleteriously affect the desired properties of the final alloy. It is desirable to maintain the impurities at amounts less than about 100 parts per million and preferably less than about 50 parts per million by weight based on the total weight of the alloy. Typical impurities include aluminum, calcium, copper, iron, chromium, magnesium, manganese, nickel, tin, sodium and molybdenum. Impurities may be present despite all efforts to achieve high purity alloy material. It is most preferred that each of the impurities be less than about 5 parts per million.

The amount of minor ingredients including additives and impurities is based on the total weight of the alloy and is dependent on the metal source used, the temperature and time of sintering and other process steps. To achieve the desired level of dopant or additive in the final alloy, the amount of dopant employed in the presintered powder is at least equal to the amount desired in the final product and possibly up to 10 times the amount.

The alloys of the present invention are prepared by powder metallurgical techniques wherein component powders are intimately mixed to an extent to assure the homogeneity of the final alloy. The powder mix is compacted to form an ingot and the ingot is sintered under conditions which result in the formation of a single phase solid solution of tungsten and tantalum.

The sintered ingots are mechanically worked and further reduced in size by rolling, swaging, drawing and annealing to obtain a wire alloy having the desired metallurgical structure. According to one aspect of the present invention the alloy wire has a fine grain structure stable at a temperature of about 2300 centigrade. According to another aspect of the present invention, the fine grain structure is recrystallized to a grain structure having large grains extending in the longitudinal direction of the wire. A temperature of greater than about 2500 degrees centigrade is needed to promote the recrystallization to the desirable large grain structure.

As compared with conventional wires of the type comprising tungsten doped with potassium, the alloy wire of the present invention retains the fine grain structure at higher temperatures. Figure 2 illustrates the grain structure when conventional doped tungsten wire is annealed at 2300C to form large elongated grains. In Figure 3, the same anneal at 2300C does not result in the formation of a large grain structure but instead retains a fine grain structure. The number of grains across the cross section of the wire is very large. Retention of the fine grain structure at high temperatures is useful for lamp filaments requiring a vibration resistant structure.

At higher anneal temperatures; on the order of 2500 degrees centigrade or greater, the fine grain structure of the alloy wire of the present invention may be recrystallized to a large grain structure similar to the structure shown in Figure 2. The grain growth proceeds primarily in the longitudinal direction of the wire and results in coarse, interlocked grains and irregular grain boundaries which form, on the average, very small angles with the surfaces of the wire. This grain structure is effective in preventing sag in lamp filaments which is primarily offsetting of grains due to slip in grain boundaries forming large angles with the wire surfaces. The alloy of the present invention is ideally suited for sag resistant filaments for electronic lamps and tubes which are operated at temperatures above which recrystallization occurs.

In addition to the beneficial metallurgical properties, the inclusion of tantalum in the alloy of the present invention permits its use as lamp components which are operated at a suitable temperature to enhance the gettering properties of tantalum. It is known that tantalum reacts with oxygen; hydrogen and halides at high temperatures. It is theorized that the resulting compounds formed by tantalum gettering may further stabilize the alloy wire grain structure due to the formation of dispersed tantalum compounds which inhibit changes in grain structure.

In addition to the above properties, the alloy of the present invention possesses suitable ductility, tensile strength and electrical resistivity that contribute to the suitability for use as a component in a lamp.

Figure 1 is illustrative of an incandescent lamp and lamp components utilized therewith. The lamp has a hermetically sealed light transmitting envelope 2. A coiled filament 6 is supported within the envelope 2 by a pair of lead-in wire 10 extending through the envelope 2 and sealed into the flat pinch 4. The filament 6 which spans the inner ends of the lead-in wires 10 is clamped at positions 14 and 16. Lead-in wires 10 have terminal portions 22 which protrude endwise from the outer end of the lamp. Outwardly of the flat pinch 4, the terminal portions 22 of the lead-in wires 10 are bend back to form double-legged contact members 24. For purpose of illustration a filament support is shown at 26.

For applications requiring a vibration resistant filament, such as in automobile tail lamps, the fine grain structure of the present invention which is stable at filament temperatures up to 2200 degrees centigrade is particularly desirable when used as the filament component 8.

In halogen lamps the envelope 2 is filled with an inert gas, such as argon, nitrogen, krypton or mixture thereof, and a halogen additive such as bromine, for example, in the form of hydrogen bromine. The total pressure of the admixed halogen and inert fill gas may range from 2 to about 7 atmospheres, at room temperatures, depending on the fill gas composition, voltage, lumen and life ratings for which the lamp is designed.

The filament may be a coiled filament or a coiled coil filament which is operated at relatively high temperatures and which is desirably sag resistant. The elongated large grain alloy structure of the present invention is suitable for use in lamps of the halogen type and in lamps of the arc discharge type. When used as a filament in a halogen lamp, the alloy wire of the present invention is operated at temperatures above the temperatures at which the gettering properties of the alloy are most favorably utilized.

The gettering properties of the alloy of the present invention are utilized most effectively when the alloy is used as a lower temperature component of the lamp such as the lead-in wires 10 or filament support 26.

The alloy of the present invention prior to coiling into filament typically has a tensile strength of from about 200 to 300 kilograms per square millimeter. More preferably, the tensile strength is greater than about 210 kilograms per square millimeter and most preferably greater than about 250 kilograms per square millimeter. The relatively high tensile strength contributes to the use of the alloy for applications relating to halogen lamps and contributes to the workability of the alloy material permitting the formation of wire.

Typically, the coefficient of expansion of the alloy of the present invention as measured at about 20°C is from about 4.3 to about 4.5×10^{-6} cm./cm. °C and more preferably the coefficient of expansion is from about 4.3 to about 4.4×10^{-6} cm./cm. °C.

The alloy typically has an electrical resistivity of about 5.5 to about 6.0 microhm ⁻cm. at 0°C. Preferably the electrical resistivity is less than about 5.7 microhm -cm. and more preferably less than about 5.6 microhm -cm.

For use in incandescent lamps, the lead wire preferably has a circular cross section with a diameter of from about 0.25 millimeters to about 0.81 millimeters. The wire size depends to some extent on the power rating of the lamp with larger diameters being preferred for higher wattage lamps.

According to the process for preparing the alloy of the present invention, substantially pure tungsten powder doped with grain controlling additives consisting essentially of potassium and silicon is mixed with substantially pure tantalum powder, the resulting powder mix is compacted to form an ingot which is sintered in a hydrogen atmosphere for a sufficient period of time and at a sufficient temperature to form a solid phase solution of tungsten and tantalum. The resulting ingot is mechanically worked into an alloy wire.

The dopants are preferably added to tungsten oxide prior to reduction to the tungsten powder. The dopants may be in any convenient form of potassium, aluminum and silicon such as silicon dioxide, alumina and potassium chloride. Potassium silicate is a preferred dopant since it serves as a source for both potassium and silicon. The percent by weight of aluminum in the doping compounds as expressed in terms of equivalent aluminum trioxide is preferably about 0.04% by weight of tungsten oxide. The percent by weight of potassium in the doping compounds, as expressed in terms of equivalent potassium oxide is preferably about 0.3% by weight of tungsten oxide. The percent by weight of silicon in the doping compounds, as expressed in terms of equivalent silicon dioxide, is preferably about 0.4% by weight of tungsten oxide. After doping the chemically treated oxide is reduced to metallic tungsten by heating in hydrogen.

Pure tantalum powder milled to obtain a fine particle size on the order of a Fisher Sub-Sieve Size of from about 5.0 microns to about 14.0 µm is mixed with the doped tungsten powder to produce powder blends having from about 0.2 to about 6 percent by weight tantalum. The blending operation is performed so as to yield a very uniformly blended doped tungsten-tantalum powder.

The resulting doped tungsten-tantalum is presintered in an inert atmosphere at about 1300°C. The ingot is next; sintered in an inert gas or hydrogen atmosphere by direct electric current resistance heating. The sintering is performed by a stepwise increase in current until a final temperature of about 2900°C is achieved. The final temperature is held for a sufficient period of time, typically on thdsorder of about 15 minutes to achieve a single phase solution of tungsten and tantalum and densification of ingot. It has been found that alloys of the present invention which have been sintered to at least about 90 percent, and more preferably to at least about 95 percent of their theoretical density (as calculated by the rule of mixtures) are sufficiently sintered to yield the solid solution.

The resulting ingot is mechanically worked by known methods using multiple swaging steps which successively reduce the cross-sectional area and intermediate annealing steps which improve mechanical workability. Annealing steps are preferably performed in a hydrogen atmosphere. The material is further reduced by drawing, through a series of successive reductions.

Example

A commercially available doped tungsten powder having an average particle size of about 4.2 µm, Sylvania AW 290, which is doped with potassium, aluminum and silicon. About 400 grams of commercially pure tantalum powder, KBI, Lot W1110, particle size of about 7.2 µm and about 19.6 kilograms of the doped tungsten powder are mixed in a blender for about one hour. A portion of the resulting mixture was compacted at a pressure of about 30,000 psi (2000 bar) to form an ingot. The compacted ingot was presintered at a temperature of about 1300°C in a vacuum at a pressure of about 1.3×10^{-2} pascals in a furnace. The ingot or rod was direct resistance sintered at 2700 to 2900°C for 15 minutes. The resulting density is about 17.6 g/cm^3. The ingot was swaged to a diameter of about 3 mm at temperture of 1600°C to 1300°C and annealed at about 2200°C at various intermediate sizes. Wire drawing from 3.3 mm diameter resulted in a size reduction to lamp wire sizes varying between 0.5 mm to 0.01 mm and was carried out at temperatures from 1000°C to 500°C in several drawing steps. The tensile strength of the wire at 0.5 mm was 2370 N/mm^2. Wire drawn to substantial smaller sizes for use as filament material will have tensile strength ranging from 2200 to 4000 N/mm^2 depending on the size and the proximity of that size to an in-process anneal. Filament wires as small as 0.01 mm are common.

Claims

1. An alloy wire consisting essentially of a single phase solid solution of tungsten and about 0.2 to about 6 percent by weight tantalum, said alloy including grain controlling additives uniformly distributed therein, said additives consisting of from 30 to 200 parts per million potassium and less than 100 parts per million silicon.

2. An alloy wire according to claim 1 having a fine grain structure stable at a temperature of about 2300 degrees centigrade.

3. An alloy wire according to claim 2 consisting of from about 2 to about 4 percent by weight tantalum.

4. An alloy wire according to claim 1 having grain structure comprising large grains extending in the longitudinal direction of the wire.

5. An alloy wire according to claim 4 wherein said grain structure is formed by recrystallization of a fine grain structure at a temperature greater than about 2500 degrees centigrade.

6. A filament for an incandescent lamp consisting essentially of a single phase solid solution of tungsten and about 0.5 to about 6 percent by weight tantalum, said filament including grain controlling additives uniformly distributed therein, said additives consisting of from 30 to 200 parts per million by weight potassium and less than 100 parts per million by weight silicon.

7. A filament according to claim 6 having a fine vibration resistant grain structure, said grain structure being stable at filament operation temperatures up to at least 2200 degrees centigrade.

8. A filament according to claim 7 having a substantially circular cross section and a diameter of from about 0.01 millimeters to about 0.5 millimeters.

9. A filament according to claim 8 having a coiled structure.

10. A filament according to claim 6 having a sag resistant grain structure comprising large grains extending in the longitudinal direction of the wire.

11. A filament according to claim 10 wherein said sag resistant grained structure is formed by recrystallization of a fine grain structure at a temperature greater than about 2500 degrees centigrade.

12. A filament according to claim 11 having a substantially circular cross section and a diameter of from about 0.01 millimeters to about 0.5 millimeters.

13. A filament according to claim 12 having a coiled structure.

14. A filament according to claim 12 having a coiled coil structure.

15. An incandescent lamp comprising a light-transmitting envelope, a filament within said envelope, and lead-in wires connected to said filament and in sealing relationship with said envelope, said incandescent lamp including a lamp component as an alloy wire consisting of a single phase solid solution of tungsten and from about 0.2 to 6 percent by weight tantalum, said alloy including grain controlling additives uniformly distributed therein, said additives consisting of from 30 to 200 parts per million potassium and less than 100 parts per million silicon.

16. An incandescent lamp according to claim 15 wherein said lamp compound has a fine vibration resistant grain structure, said grain structure being stable at temperatures up to at least 2200 degrees centigrade.

17. An incandescent lamp according to claim 16 wherein said lamp component comprises said lead-in wires.

18. An incandescent lamp according to claim 17 wherein said lamp component comprises said filament.

19. An incandescent lamp according to claim 17 wherein said lamp is a halogen lamp.

20. An incandescent lamp according to claim 15 wherein said lamp is a halogen lamp.

21. An incandescent lamp according to claim 20 wherein said lamp component comprises said filament; said filament having a sag resistant grain structure comprising large grains extending in the longitudinal direction of the wire.

22. An incandescent lamp according to claim 21 wherein said sag resistant grained structure is formed by recrystallization of a fine grain structure at a temperature greater than about 2250 degrees centigrade.

23. An incandescent lamp according to claim 22 wherein said filament has a coiled coil structure.

24. An incandescent lamp according to claim 20 wherein said lamp includes a gettering means; said gettering means comprising lamp component.

25. An incandescent lamp according to claim 24 wherein at least one of said lead-in wires comprise said gettering means.

26. An incandescent lamp according to claim 24 wherein said gettering means comprises a filament support.

27. A method of producing a tungsten-tantalum alloy wire comprising the steps of: mixing substantially pure tungsten powder doped with grain controlling additives consisting of potassium and silicon and substantially pure tantalum powder, compacting the powder to form an ingot, sintering the ingot in a hydrogen or vacuum atmosphere for a sufficient period of time to form a solid phase solution of tungsten and tantalum, and mechanically working the resulting ingot into an alloy wire.

28. A method of producing a tungsten-tantalum alloy wire according to claim 27 wherein sufficient tantalum powder is mixed to give a resulting alloy wire consisting essentially of tungsten and from 0.2 to 6 percent by weight tantalum.

Revendications

1. Un fil en alliage comprenant essentiellement une solution solide en phase unique de tungstène et entre 0,2 et 6% environ en poids de tantale, le dit alliage incluant des additifs de contrôle des grains uniformément répartis à l'intérieur, les dits additifs comprenant entre 30 et 200 parts par million de potassium et moins de 100 parts par million de silicium.

2. Un fil en alliage selon la revendication 1 caractérisé en ce qu'il comprend une structure en grains fins stable à une température de 2300°C environ.

3. Un fil en alliage selon la revendication 2 caractérisé en ce qu'il comprend entre 2 et 4% en poids environ de tantale.

4. Un fil en alliage selon la revendication 1 caractérisé en ce que la structure en grains comprend des grains importants s'étendant dans le sens longitudinal du fil.

5. Un fil en alliage selon la revendication 4 caractérisé en ce que la dite structure en grains est réalisée par recristallisation d'une structure en grains fins à une température supérieure à 2500°C environ.

6. Un filament pour lampes à incandescence consistant essentiellement en une solution solide en phase unique de tungstène et entre 0,5 et 6% en poids environ de tantale, le dit filament incluant des additifs de contrôle des grains uniformément distribués à l'intérieur, les dits additifs comprenant entre 30 et 200 parts par million en poids de potassium et moins de 100 parts par million en poids de silicium.

7. Un filament selon la revendication 6 présen-

tant une structure en grains fins résistant aux vibrations, la dite structure en grains étant stable aux températures de fonctionnement du filament jusqu'à au moins 2200°C.

8. Un filament selon la revendication 7 caractérisé en ce qu'il présente une section de forme substantiellement circulaire et un diamêtre comprise entre 0,01 et 0,5 millimêtre environ.

9. Un filament selon la revendication 8 caractérisé en ce qu'il affecte la forme d'une bobine.

10. Un filament selon la revendication 6 caractérisé en ce qu'il comprend une structure en grains résistant à la pliure comportant des grains importants s'étendant dans le sens longitudinal du fil.

11. Un filament selon la revendication 10 caractérisé en ce que la structure en grains résistant à la pliure est obtenue par recristallisation d'une structure en grains fins à une température supérieure à 2500°C environ.

12. Un filament selon la revendication 11 caractérisé en ce qu'il présente une section de forme substantiellement circulaire et une diamêtre compris entre 0,01 et 0,5 millimêtre environ.

13. Un filament selon la revendication 12 caractérisé en ce qu'il affecte la forme d'une bobine.

14. Un filament selon la revendication 12 caractérisé en ce qu'il affecte la forme d'une bobine bobinée.

15. Une lampe à incandescence comprenant une ampoule transparente, un filament à l'intérieur de la dite ampoule, et des entrées de courant reliées au dit filament et scellées dans la dite ampoule, la dite lampe à incandenscence incluant un composant tel qu'un fil en alliage consistant en une solution solide en phase unique de tungstène et entre 0,2 et 6% en poids environ de tantale, le dit alliage comprenant des additifs de contrôle des grains uniformément distribués à l'intérieur, les dits additifs consistant entre 30 et 200 parts par million de potassium et moins de 100 parts par million de silicium.

16. Une lampe à incandescence selon la revendication 15 caractérisée en ce que le dit composant présente une structure en grains fins résistant aux vibrations, la dite structure en grains étant stable jusqu'à une température supérieure à au moins 2200°C.

17. Une lampe à incandescence selon la revendication 16 caractérisée en ce que les dites entrées de courant font partie du dit composant.

18. Une lampe à incandescence selon la revendication 17 caractérisée en ce que le dit filament fait partie du dit composant.

19. Une lampe à incandescence selon la revendication 17 caractérisée en ce que la dite lampe est une lampe à halogène.

20. Une lampe à incandescence selon la revendication 15 caractérisée en ce que la dite lampe est une lampe à halogène.

21. Une lampe à incandescence selon la revendication 20 caractérisée en ce que le dit filament fait partie du dit composant et présente une structure en grains résistant à la pliure comprenant des grains importants s'étendant dans le sens longitudinal du fil.

22. Une lampe à incandescence selon la revendication 21 caractérisée en ce que la dite structure en grains résistant à la pliure est obtenue par recristallisation d'une structure en grains fins à une température supérieure à 2500°C environ.

23. Une lampe à incandescence selon la revendication 22 caractérisée en ce que le dit filament affecte la forme d'une bobine bobinée.

24. Une lampe à incandescence selon la revendication 20 caractérisée en ce que la dite lampe comprend un moyen formant getter et faisant partie du dit composant.

25. Une lampe à incandescence selon la revendication 24 caractérisée en ce qu'au moins l'une des entrées de courant comporte le dit moyen formant getter.

26. Une lampe à incandescence selon la revendication 24 caractérisée en ce qu'un support de filament est inclus dans le dit moyen formant getter.

27. Procédé pour réaliser un fil en alliage tungstène-tantale caractérisé en ce qu'il comporte les étapes suivantes:

— mélange d'une poudre de tungstène substantiellement pure, dopée au moyen d'additifs de contrôle des grains comprenant du potassium et du silicium et une poudre de tantale substantiellement pure,
— compactage de la poudre pour former un lingot,
— frittage du lingot sous hydrogène ou sous vide pendant un temps suffisant pour former une solution en phase solide de tungstène et de tantale, et
— transformation mécanique du lingot résultant en un fil en alliage.

28. Procédé pour réaliser un fil en alliage de tungstène et de tantale selon la revendication 27 caractérisé en ce que l'on mélange suffisamment de poudre de tantale pour obtenir un fil en alliage consistant essentiellent de tungstène et entre 0,2 et 6% en poids de tantale.

Patentansprüche

1. Legierungsdraht, im wesentlichen bestehend aus einer einphasigen festen Lösung aus Wolfram und ungefähr 0,2 bis ungefahr 6 Gew.-% Tantal, wobei die Legierung Zusatzstoffe zur Kornregelung umfaßt, welche in dieser gleichmäßig verteilt sind, wobei die Zusatzstoffe aus 30 bis 200 ppm Kalium und weniger als 100 ppm Silicium bestehen.

2. Legierungsdraht nach Anspruch 1 mit einer feinen Kornstruktur, welche bei einer Temperatur von ungefähr 2300°C beständig ist.

3. Legierungsdraht nach Anspruch 2, bestehend aus ungefähr 2 bis ungefähr 4 Gew.-% Tantal.

4. Legierungsdraht nach Anspruch 1, mit einer Kornstruktur, welche große, sich in Längsrichtung des Drahtes erstreckende Körner aufweist.

5. Legierungsdraht nach Anspruch 4, wobei die Kornstruktur durch Rekristallisation einer feinen Kornstruktur bei einer Temperatur höher als ungefähr 2500°C gebildet ist.

6. Glühfaden für eine Glühlampe, bestehend im wesentlichen aus einer einphasigen festen Lösung aus Wolfram und ungefähr 0,5 bis ungefähr 6 Gew.-% Tantal, wobei der Glühfaden Zusatzstoffe zur Kornregelung aufweist, welche in diesem gleichmäßig verteilt sind, wobei die Zusatzstoffe aus 30 bis 200 Gew.-ppm Kalium und weniger als 100 Gew.-ppm Silicium bestehen.

7. Glühfaden nach Anspruch 6 mit einer feinen, schwingungsbeständigen Kornstruktur, wobei die Kornstruktur bei Betriebstemperaturen des Glühfadens bis zu wenigstens 2200°C stabil ist.

8. Glühfaden nach Anspruch 7 mit einem im wesentlichen kreisförmigen Querschnitt und einem Durchmesser von ungefähr 0,01 mm bis ungefähr 0,05 mm.

9. Glühfaden nach Anspruch 8 mit einer wendelartigen Struktur.

10. Glühfaden nach Anspruch 6 mit einer durchbiegungsbeständigen Kornstrucktur, welche große, sich in Längsrichtung des Drahtes erstreckende Körner umfaßt.

11. Glühfaden nach Anspruch 10, wobei die durchbeigungsbeständige Kornstruktur durch Rekristallisation einer feinen Kornstruktur bei einer Temperatur höher als ungefähr 2500°C gebildet ist.

12. Glühfaden nach Anspruch 11 mit einem im wesentlichen kreisförmigen Querschnitt und einem Durchmesser von ungefähr 0,01 mm bis ungefähr 0,5 mm.

13. Glühfaden nach Anspruch 12 mit einer wendelartigen Struktur.

14. Glühfaden nach Anspruch 12 mit einer doppeltgewendelten Struktur.

15. Glühlampe mit einem lichtdurchlässigen Gehäuse, einem Glühfaden im Inneren des Gehäuses und Anschlußdrähten, welche mit dem Glühfaden verbunden und mit dem Gehäuse dichtend in Eingriff sind, wobei die Glühlampe einen Lampenbauteil in Form eines Legierungsdrahtes umfaßt, welcher aus einer einphasigen festen Lösung aus Wolfram und ungefähr 0,2 bis 6 Gew.-% Tantal besteht, wobei die Legierung Zusatzstoffe zur Kornregelung aufweist, welche gleichmäßig in dieser verteilt sind, wobei die Zusatzstoffe aus 30 bis 200 ppm Kalium und weniger als 100 ppm Silicium bestehen.

16. Glühlampe nach Anspruch 15, wobei der Lampenbauteil eine feine, schwingungsbeständige Kornstruktur aufweist, wobei die Kornstruktur bei Temperaturen bis zu wenigstens 2200°C stabil ist.

17. Glühlampe nach Anspruch 16, wobei das Lampenbauteil Anschlußdrähte aufweist.

18. Glühlampe nach Anspruch 17, wobei das Lampenbauteil den Glühfaden umfaßt.

19. Glühlampe nach Anspruch 17, wobei die Lampe eine Halogenlampe ist.

20. Glühlampe nach Anspruch 15, wobei die Lampe eine Halogenlampe ist.

21. Glühlampe nach Anspruch 20, wobei der Lampenbauteil den Glühfaden umfaßt; wobei der Glühfaden eine durchbiegungsbeständige Kornstruktur aufweist, welche große, sich in Längsrichtung des Drahtes erstreckende Körner umfaßt.

22. Glühlampe nach Anspruch 21, wobei die durchbiegungsbeständige Kornstruktur durch Rekristallisation einer feinen Kornstruktur bei einer Temperatur höher als ungefähr 2500°C gebildet ist.

23. Glühlampe nach Anspruch 22, wobei der Glühfaden eine doppelwendelartige Struktur aufweist.

24. Glühlampe nach Anspruch 20, wobei die Lampe eine Gettereinrichtung aufweist; wobei die Gettereinrichtung ein Lampenbauteil umfaßt.

25. Glühlampe nach Anspruch 24, wobei zumindest einer der Anschlußdrähte die Gettereinrichtung umfaßt.

26. Glühlampe nach Anspruch 24, wobei der Gettereinrichtung eine Glühfadenlagerung umfaßt.

27. Verfahren zur Herstellung eines Drahtes auf einer Wolfram-Tantallegierung mit folgenden Arbeitsschritten: Mischen von im wesentlichen reinem Wolframpulver, welches mit Zusatzstoffen zur Kornregelung dotiert ist, welche aus Kalium und Silicium und im wesentlichen reinem Tantalpulver bestehen, Verdichten des Pulvers zur Bildung eines Rohlings, Sintern des Rohlings in einer Wasserstoff- oder Vakuumatmosphäre über eine ausreichenden Zeitdauer, um eine feste Lösung auf Wolfram und Tantal zu bilden, und mechanische Verarbeitung des gebildeten Rohlings zu einem Legierungsdraht.

28. Verfahren zur Herstellung eines Wolfram-Tantal-Legierungsdrahtes nach Anspruch 27, wobei eine ausreichende Menge an Tantalpulver beigemischt wird, um einen Legierungsdraht zu erzeugen, welcher im wesentlichen aus Wolfram und von 0,2 bis 6 Gew.-% Tantal besteht.

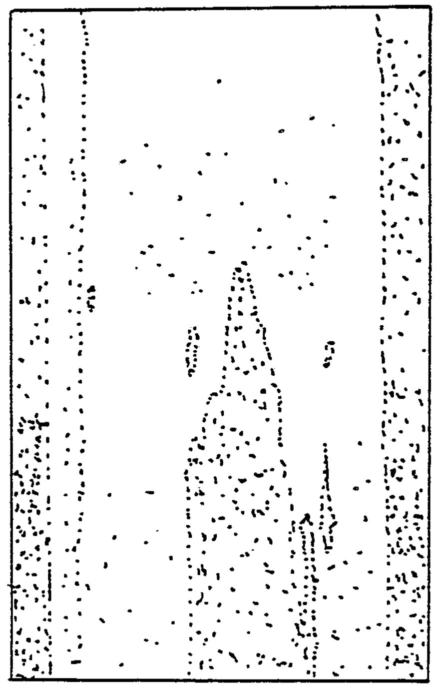

FIG.2

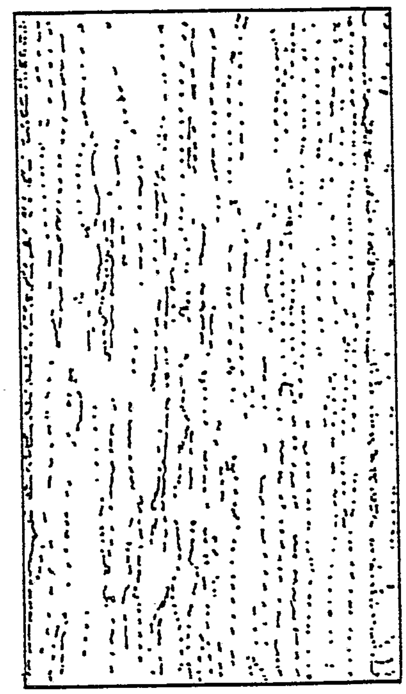

FIG.3

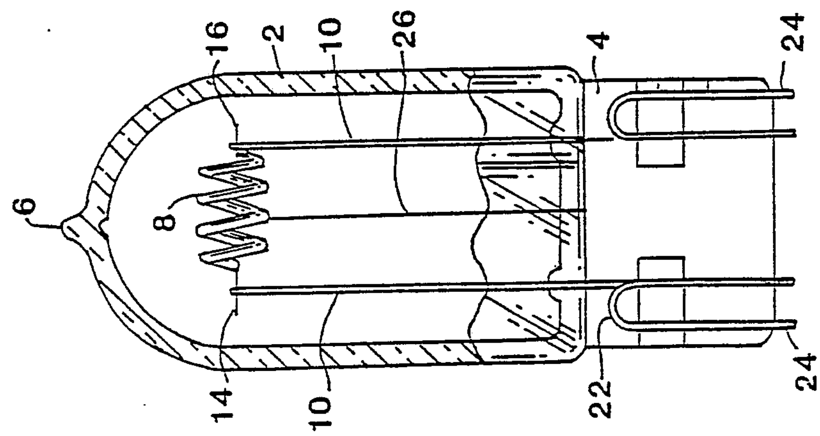

FIG.1