

[54] **METHOD FOR SEALING THE CUTTING OR SEPARATION SURFACES OF RADIOACTIVE FOILS**

[75] Inventor: **Gustav A. Purt**, Rapperswil, Switzerland

[73] Assignee: **Cerberus AG Mannedorf**, Germany

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[56]

References Cited

UNITED STATES PATENTS

3,115,702	12/1963	Skutt et al.	29/498 X
3,188,732	6/1965	Feduska et al.	29/498 X
3,478,416	11/1969	Hamilton.....	29/498
2,476,644	7/1949	Wallhausen.....	250/106 S
3,567,943	3/1971	Wallhausen.....	250/106 S

Primary Examiner—Robert L. Spruill

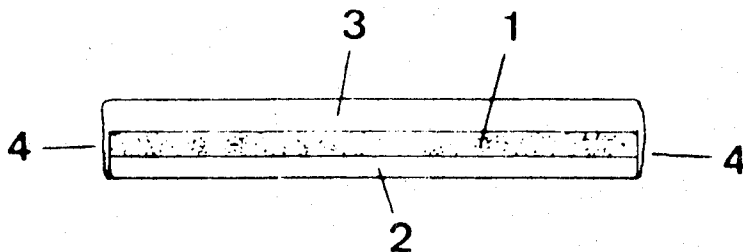
Attorney—Werner W. Kleeman

[57]

ABSTRACT

There is disclosed a method for sealing or closing the cutting surfaces of radioactive foils covered at both sides with protective- or support layers formed of a noble metal, which comprises the steps of heating the foil for at least ten minutes to at least 60 percent of the absolute temperature of the melting point of the lowest melting protective- or support metal layer.

7 Claims, 2 Drawing Figures



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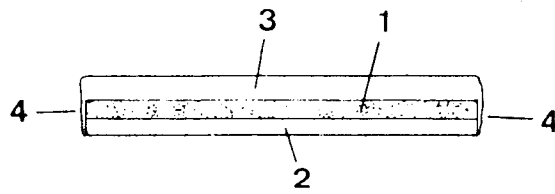


Fig. 1

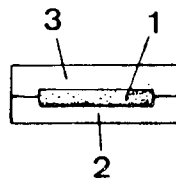


Fig. 2

INVENTOR

GUSTAV A. PURT

BY *Werner W. Klemm*

ATTORNEY

METHOD FOR SEALING THE CUTTING OR SEPARATION SURFACES OF RADIOACTIVE FOILS

BACKGROUND OF THE INVENTION

The present invention relates to an improved method for sealing or closing the cutting or separation surfaces of radioactive foils which are covered at both sides with metallic non-active protective layers.

Radioactive foils are advantageously employed, in all instances, where there is desired a surface contact radioactive radiation. For example, in ionization compartments or chambers, as such are employed in automatic fire alarms, dust measuring devices and gas analyzers, radioactive foils are used which employ for the active material AmO_2 , RaS , RaSO_4 , or similar substances, in a thin surface contact form. The surfaces of these foils are covered with a thin metallic protective layer, for instance formed of gold, silver, palladium, or other noble metals as well as combinations of such layers, in order to protect against contamination and damage. To increase the stability these covered foils are applied to a metallic supporting surface, for instance formed of silver.

During the manufacture of ionization chambers, these foils are then cut or stamped to the desired size, with the result that at the end or side surfaces the radioactive material is open to the surroundings, resulting in a contamination danger.

Now, it is known for the purpose of preventing such contamination danger that the cut foils are embedded in a support in such a manner that the cutting or separation edges are covered by the supporting material. Furthermore, it is known to the art to flex or bend over the cutting edges and to apply the foil together with the bent edges to a supporting material, for instance to roll such foil onto the supporting material, in order to prevent any escape of radioactive materials. These mechanical techniques, however, require a great deal of expenditure of work which, furthermore, is associated with the danger of contaminating the tools.

Additionally, it is known to the art to cover the cutting or separation edges of the foil with a lacquer or other suitable coating. However, during the course of time this lacquer coating tends to decompose under the action of the radioactive radiation and becomes porous.

Furthermore, it is known to vaporize non-active material, for instance metal, onto the cutting edges. However, since a separate vaporization of each individual edge is exceptionally uneconomical, this technique is generally carried out with foil packages. Yet, however, such a package-type vaporization of foil cutting or separation surfaces does not render it possible to also cover the edges of these cutting surfaces, from which there still can escape radioactive material.

SUMMARY OF THE INVENTION

Accordingly, it is a primary objective of the present invention to effectively overcome the aforementioned drawbacks of the prior art techniques.

Another, more specific object of the present invention is to provide a positive and economical technique or method for covering the cutting or separation surfaces of radioactive foils which are covered at both sides with a metallic layer of material in order to protect against radioactive contamination.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive method contemplates the steps of heating the radioactive foil for at least 10 minutes to at least 60 percent of the absolute temperature of the melting point of the lowest melting metal from which the protective-or support layer for the foil is formed.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing wherein:

FIG. 1 is a longitudinal sectional view of an example of a radioactive foil which is cut from strip- or band-shaped material and the cutting edges of which have been closed according to the inventive method; and

FIG. 2 is a cross-sectional view of the structure shown in FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the invention in greater detail, it is to be understood that the invention relies upon the fact that at approximately 60 percent of the absolute temperature of the melting point of a metal the surface mobility of the metal atoms is already so large that an appreciable migration of material occurs along the surface. With sufficiently long heating time, so much inactive material surface migrates or moves to the cutting edges that there results a solid, uniform and sufficiently thick protective layer. Since the melting point of radioactive compounds is generally greater than the melting point of the noble metals used as the protective-or support layers, with the inventive process, the radioactive materials are not influenced or adversely affected.

With an oftentimes employed foil using americium oxide as the radioactive material, which is embedded in gold and covered with thin gold layers and applied to a carrier or support foil formed of silver, heating to 600°C . for 30 minutes is sufficient to achieve that so much silver material has migrated to the cutting edges that contamination can no longer be detected.

Of course, the heating time and the temperature must be matched or accommodated to the material which is being employed.

Since certain metals after having been heated to such a high temperature become relatively soft and are difficult to handle, it is desirable to either subsequently make use of a suitable hardening process or to apply the material to a further carrier or support foil.

In addition to the described inventive treatment, it is advantageous in a number of instances, either before or after the migration heat treatment or annealing operation, to undertake a known chemical cleaning of the cutting surfaces, for instance with complexing agents or to undertake an ultrasonic cleaning treatment, or to additionally employ both techniques.

Referring now to the drawing, FIGS. 1 and 2 depict in longitudinal section and in cross-sectional view, respectively, an exemplary embodiment of radioactive foil which has been cut from strip- or band-shaped material i.e. a laminate formed of the radioactive foil

bonded between the covering layers and the cutting or separation edges of which have been sealed according to the inventive method. By referring to these figures there will be seen that a core 1 consisting of americium oxide embedded in gold is covered at one side or face with a gold layer 2 and at the other side or face with a silver layer 3. The layer thicknesses amount to only several μ (microns i.e. 1/1000mm.). Along the longitudinal sides the protective layers 2 and 3 extend past the active core 1 and can be tightly closed very easily, for instance by rolling. On the other hand, upon cutting of the closed or sealed band, the active material at the cutting or separation surfaces appears at the surface. Now, by heating to 600°C. for at least 30 minutes enough silver material migrates from the support layer 3 to the cutting edges that the latter are covered with a thin silver layer 4, as shown, which effectively prevents contamination of the surroundings. In analogous manner it is also possible to close or seal the cutting surfaces of optionally formed radioactive preparations, for instance substantially ring-shaped or circular-shaped foils, which have been stamped out of radioactive bands covered at both sides.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims. ACCORDINGLY,

What is claimed is:

1. A method of covering the cutting or separation surfaces of a radioactive foil covered at each side with a respective layer of material formed of at least one noble metal having a melting point lower than the melting point of said radioactive foil in order to protect against radioactive contamination, said method comprising the step of heating the radioactive foil for at least ten minutes to a temperature from 60 percent of the absolute temperature of the melting point of that one of said noble metals having the lowest melting point to below the melting point of said noble metal.

2. The method as defined in claim 1, including the

step of subjecting the cutting surfaces of the foil prior to heat treatment to a chemical cleaning operation.

3. The method as defined in claim 1, further including the step of subjecting the cutting surfaces of the foil to a chemical cleaning operation subsequent to the heat treatment.

4. A method as defined in claim 1, including the step of subjecting the cutting surfaces of the foil to an ultrasonic cleaning operation prior to heat treatment.

5. The method as defined in claim 1, including the step of subjecting the cutting surfaces of the foil to an ultrasonic cleaning operation subsequent to the heat treatment.

6. The method as defined in claim 1, including the steps of using for the radioactive foil americium oxide and for the covering material layers a member selected from the group comprising gold and silver, and heating such radioactive foil together with the covering material layers for at least 30 minutes to at least 600°C.

7. A method of sealing the cut end surfaces of a radioactive foil laminated between a pair of covering layers, comprising the steps of providing a laminate formed of a radioactive foil bonded to each side between a respective covering layer of material formed of at least one noble metal having a melting point lower than the melting point of said radioactive foil, cutting the laminate into a desired size and shape to thereby form exposed cut end surfaces of the radioactive foil, and sealing such cut end surfaces of the radioactive foil to protect against contamination by heating the laminate for at least ten minutes in order to raise the temperature of the radioactive foil to a value which is from 60% of the absolute temperature of the melting point of the noble metal of the covering layer possessing the lowest melting point material to below the melting point of said noble metal to cause surface migration of such lowest melting point noble metal towards the cut end surfaces of the radioactive foil, and depositing through such surface migration the migrated material of the lowest melting point noble metal about such cut end surfaces of the radioactive foil to seal the latter so as to prevent contamination.

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