June 25, 1929. A. FISCHER 1,718,899

METHOD OF UNITING RADIOACTIVE MATERIAL WITH A METALLIC CARRIER

Filed Aug. 31, 1927

Fig. 1

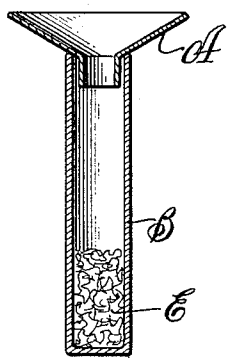


Fig. 3

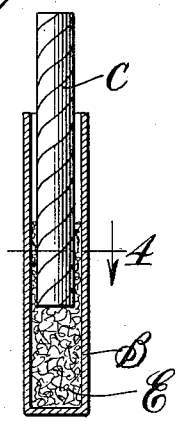


Fig. 4

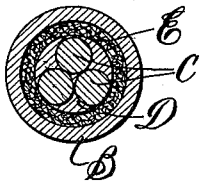


Fig. 2

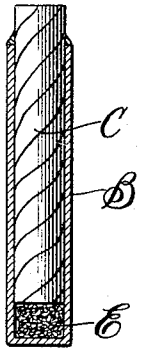
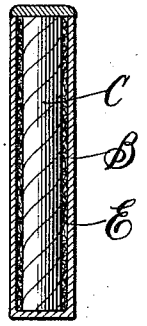


Fig. 5



Inventor:
Alois Fischer,
By Dyrenforth, Lee, Chritton & Wilkie
Attys.

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UNITED STATES PATENT OFFICE.

ALOIS FISCHER, OF WIEN, VIENNA, AUSTRIA.

METHOD OF UNITING RADIOACTIVE MATERIAL WITH A METALLIC CARRIER.

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This invention refers broadly to means of incorporating or uniting radio-active substances, such as for instance salts of radium or of mesothorium and the like with metallic and similar carriers, and it is intended, among other important objects and advantages, to provide means of arriving at a better and more thorough utilization of the active rays of such material, and to greatly improve and facilitate the manipulation of such material and carriers and to greatly increase the applicability thereof, and with these and other objects in view the radio-active substances are combined with a metallic carrier, such for instance as platinum, iridium, platin-iridium or the like of any suitable shape or condition, such as thin plates, films, wires, very thin tubes or similar containing or carrying agents. The products obtained in this manner may be used for a variety of purposes for which radio-active substances are usually applied, particularly scientific, medicinal and similar purposes and the combination of carriers with radio-active substances according to my invention among other uses affords a very handy and efficient means for the medical practitioner in the treatment of various diseases and ailments with the inclusion of dental and other purposes, though the invention is not restricted to such particular exemplification of applicability.

Formerly, radiating substances, as for example, radium or mesothorium, if one wished to use their rays, were put into a glass or metal case, and closed air-tight; or, these substances were fastened to the surface of metal foil, textile, or web, by means of varnish or other suitable cement. In the first instance, with the use of glass or metal cases, the container could not be made as small as desired because in such case the radiating substance could not be contained in it. In the second case, where the radiating substance was fastened on the surface of a metal foil or web, it was not sufficiently protected against waste. Also, in the first case only the gamma-rays and the harder beta-rays and no alpha and soft beta-rays were obtained. In the second case, only alpha-rays and part of the soft beta-rays and no hard beta or gamma-rays were obtained.

Now my invention, among other important objects and advantages is intended to overcome these difficulties by providing means of incorporating the radio-active substances with metals or metal alloys from which various articles may be manufactured for irradiating purposes and for the treatment with radio-active substances. In accordance with my invention it has been ascertained that metals or alloys which have come into intimate contact with radio-active substances, such as chemical of radium, mesothorium or the like may be perfectly combined with these substances.

I have succeeded, according to my invention, in incorporating the radiating substances in the manner of an alloy so closely into the metal or the alloy that the emanations in the metal are sufficiently held back to be broken down in the metal itself, and thus release gamma rays, while the metal allows the greater part of the alpha and beta rays of the radiating incorporated substances to escape. The incorporation is so close that the radiating substance is not merely found in the hollow spaces of the metal itself, but is alloyed with it and incorporated with it; so that it is now possible to draw the metal or the alloy as one wishes into fine wires or thin plates, and the like. All these substances then emit alpha, beta and gamma rays.

A similar gas-tight union of the metals or metal alloys with the radio-active substance may also be effected by causing the substances to be deposited by electrolysis upon the metals or alloys, and in further pursuance thereof such rays-emitting precipitate may be more securely fixed by depositing thereon an additional metal coating by electric or any other well-known means. This metal coating may be secured to the base by heating it to the melting temperature.

I shall now describe more in detail what I consider preferred methods of carrying out the process of incorporation according to this invention and the instrumentalities used in connection therewith without, however, restricting the invention to such particular forms of exemplification, and I wish to be understood that the invention is not limited to utilization for medical and therapeutic purposes, but it may be employed in various arts within the scope and spirit of the invention.

For medical and various other purposes, it is of advantage to employ non-oxidizing metals such as platinum, platinum alloys or other noble metals, or difficultly oxidizing metals. The metal carriers may be in the

form of wires, needles, small tubes, but it is obvious that any other forms and configurations of receptacles or carriers may be used in accordance with the particular conditions of application, thus, for instance, in the case of treatment of diseases, in conformity with the position, the degree of accessibility and size of the particular diseased part or other point to be treated.

The charging of the small containers is effected with comparatively larger sizes thereof in the well known manner, thus for instance by directly charging the solid radio-active substance into the container or by filling it with the required amount of solution of these substances, and then vaporizing the solvent, or in any other suitable manner. The gas-tight closure of the container after charging it with the radio-active substance may be effected by melting, soldering, welding, or by a screw cap or the like.

The incorporating of radio-active substance to carriers may be effected in different ways in accordance with the particular mode of employment, as more particularly set forth by way of illustrating in the following examples, which show that the employment of especially smaller and thinner carriers which emit all three of the rays has for the first time become possible through my invention.

In the accompanying drawings, I have shown one form of apparatus for carrying out my invention. In such drawings, Fig. 1 is a vertical sectional view of the small metal tube with a funnel in it for putting in the radio-active compound; Fig. 2 is a similar view showing the wire in place; Fig. 3 is a similar view showing a modified form; Fig. 4 is a view taken as indicated by the line 4 of Fig. 3, and Fig. 5 is a view of the apparatus shown in Fig. 3 showing the tube sealed.

Example 1.—A chemical compound of a radio-active substance, like radium chloride, is put in a small tube, closed at one end and preferably made of noble and not readily oxidizable metal or alloy, for example, platinum, or platinum-iridium, and then the opening of the small tube is closed air-tight and suitably fused. The small metal tube is then heated to a point below the melting temperature thereof so that the radio-active chemical compound in the tube becomes disassociated. The radio-active ion of the compound alloys with the metal of the small tube and thereby disappears entirely from the hollow space in the small tube. This can easily be shown. The radio-active metal made in this way can then be made into any form for any desired purpose. For example, for the treatment of the root canal of an affected tooth, it may be drawn into a fine wire, or, for other purposes, it may be rolled into sheets, or hammered or cut into any desired shape.

Example 2.—In the treatment of the roots of teeth it becomes frequently necessary to concentrate the action of the radio-active substance unto a single point. In this case, I may use a small narrow tube B (Fig. 1) of platinum closed at one end and possessing substantially the dimensions hereinbefore referred to into which the radio-active substance E may be introduced, for instance, through a small funnel A (Fig. 1) with a charging opening of fifteen hundredths to thirty hundredths of a millimeter diameter, and by slightly shaking the tube. After a short practive, the very finely powdered substance will be introduced without difficulty, whereupon the charge is compressed by means of a wire C fitting the cavity of the tube, and is pushed towards the closed end thereof. The thin wire C (Fig. 2) used for this purpose may preferably be prepared in the following manner. It consists preferably of a material of greater hardness than the tube, thus, for instance, of platin-iridium and is spirally twisted or threaded and is subsequently coated with a platinum solder melting at a high temperature and drawn out to the desired thickness, so that the wire will exactly fit into the tube. Thereupon this wire which extends up to the radio-active substance which has been compressed in the cavity of the tube towards the closed end thereof is gas-tightly united to the open end thereof by soldering or welding or in any other suitable manner. The small tube is then heated at its end containing the radio-active substance to a high temperature below the melting temperature of the platinum and by this means the metal of the tube is rendered radio-active at the point where the radio-active substance is disposed.

Example 3.—When it is desired to render a small tube of similar small size radio-active for its entire length, the following procedure may preferably be employed. The charging of the tube B (Fig. 3 which is closed at one end is effected as described with reference to Example 2) with the difference, however, that the charge is not accumulated only at the closed pointed end, but larger quantities of radio-active substance are introduced into which the wire C (Fig. 3) which has been treated as described with reference to the preceding example, D indicating the solder, with the additional provision that after the drawing out the wire is again spirally twisted, is screw-threadedly introduced, so to speak, so that the radio-active substance is thereby uniformly forced against the interior wall of the small tube. By this means the important result is produced, that not more of the radio-active substance is employed for activating the small tube than is absolutely necessary for this purpose, a point of great importance in view of the high expense of the radio-active substances.

The small tubular receptacle which at its interior surface has thus been covered with

the radio-active substance, but is otherwise filled with the spirally twisted platinum wire C (Fig. 4), or wires of platinum-iridium, is then closed at its open end, as described with reference to the second example by being fused, welded or soldered with the platin-iridium wire contained therein, so as to effect a gas-tight closure. The tube is then heated for its entire length to a high temperature by which means the tube or the metal thereof becomes activated. That the activation in accordance with the second example has actually been effected at the point or at a portion of the tube only while in the case of the third example the platinum tube has become activated for its entire length may be easily proved by means of a luminous screen.

The radio-active metallic containers or metallic pencils obtained by any of the methods hereinbefore described or in any other suitable manner may be used for a variety of purposes in the different arts or for scientific and other purposes. If used for dental purposes, for instance, such pencils may possess a length of about 15 millimeters, and in order to more easily distinguish the soldered end, the tubes or pencils may for instance be flattened at this point or provided with an eye at this end. By this means the operator is enabled in the case of pencils with point-like radio-activity to easily find the radio-active side of the pencil without a luminous screen.

While I have described various exemplifications of the principles of my invention in this specification, it should be understood that the examples and the general description of the invention are merely given by way of illustration and should not be interpreted by way of limitation of the invention and it should be understood that other modifications and changes are possible within the scope and spirit of the invention, except as otherwise stated in the accompanying claims.

What I claim as new, and desire to secure by Letters Patent, is:

1. The method of uniting a radio-active substance with a metallic carrier, which consists in causing a chemical compound of the radio-active substance to be brought into intimate contact with the metallic carrier, and then become incorporated with the metallic carrier by heat.

2. The method of uniting a radio-active substance with a metallic carrier consisting of a metal of the platinum group, which consists in causing a chemical compound of the radio-active substance to be brought into intimate contact with the metallic carrier, and then become incorporated with the metallic carrier by heat.

3. The method of uniting a radio-active substance with a metallic carrier consisting of a metal of the platinum group, which consists in causing a chemical compound of the radio-active substance to be brought into intimate contact with the metallic carrier, and then become incorporated with the metallic carrier by heat.

4. The method of uniting a radio-active substance with a metallic carrier, which consists in placing a chemical compound of the radio-active substance in a substantially small tubular metallic carrier closed at one end, closing the other end of the carrier gas-tight, and then heating the carrier to a glowing temperature.

5. The method of uniting a radio-active substance with a metallic carrier, which consists in placing a chemical compound of the radio-active substance in a substantially small tubular metallic carrier made of metal of the platinum group closed at one end, closing the other end of the carrier gas-tight, and then heating the carrier to a glowing temperature.

6. The method of uniting a radio-active substance with a metallic carrier, which consists in introducing a chemical compound of the radio-active substance in a substantially tubular metal carrier closed at one end, pressing the compound together against the closed end of the carrier, filling in the free space of the carrier with a screw-like twisted wire covered with solder, closing the opening of the carrier gas-tight, and then heating the carrier to a glowing temperature to cause the radio-active substance at the end of the metallic carrier to become incorporated with it.

7. The method of uniting a radio-active substance with a metallic carrier which consists in introducing a chemical compound of the radio-active substance into a substantially tubular metallic carrier closed at one end, then introducing into the hollow space of the carrier a screw-like twisted wire coated with solder, to force the radio-active substance against the sides of the tubular carrier, then closing the carrier, and then heating the carrier to a glowing temperature so that the radio-active substance becomes united with the metallic carrier throughout substantially its entire length.

ALOIS FISCHER.