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IMPREGNATED METAL AND METHOD OF
PRODUCING SAME

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This invention relates to the treatment of metal and metal products and more particularly to a metal article of a proper degree of porosity impregnated with materials, preferably in the form of liquids, that will evaporate slowly at normal temperatures and pressures and thus permeate the adjacent atmosphere.

In carrying out the invention, we provide a porous metal member which may be of any form or shape. Thus, in one form, articles of jewelry, such as earrings, rings, bracelets, pins, combs, compacts, novelty jewelry or the like, are formed of porous metal and impregnated with an oil or liquid having a pleasant odor, such as a perfume. In other forms, the porous metal member is impregnated with a slowly-vaporizing liquid having germicidal, disinfecting, sterilizing, pesticidal, or other characteristics. In such instances, it is not essential that the liquid be further characterized by having a distinctive odor. Any known method of forming the metal body, such as powder metallurgy, evaporation of mercury from amalgams, metal spraying or sintering of metal powders mixed with other substances which decompose with evolution of gas may be employed.

The porous metal forming the base of the article should possess certain characteristics to incorporate the best features of the invention. The majority of the voids or passageways in the metal should be interconnected and should have communication with the surface. The voids should be kept within limits of 5 percent to 45 percent of the total volume depending upon the mechanical strength required of the object in the use to which it is put. The cross sectional dimensions of the voids should be relatively small in proportion to length, that is, the exposed metal surface within the void should be high with respect to the volume of liquid contained therein. This insures a better tying of the liquid to the metal surface and thus a longer period of generation of the desired atmosphere.

It is, of course, well known to produce metal objects which are porous, and porous metals, in conjunction with solid or liquid lubricants, are used to a great extent in bearings. In carrying out the invention the porous metal bodies of the desired shape may be formed in any suitable manner. They may be sintered from powdered metal, according to well known powder metal techniques. They may be formed from amalgams of the desired metal and mercury from which the mercury is evaporated. They may be formed by spraying molten metal into molds or other forms of the desired shape. Metal pow-

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ders may be mixed with metallic carbonates or other substances which decompose with evolution of gas and then sintered.

After the metal body of the desired shape has been formed, it may be impregnated with the desired liquid by any of the commonly known methods. Thus, the air in the voids may be expanded by heating of the metal object and the object then submerged in the liquid to fill or nearly fill the voids upon contraction of the remaining air. The air may be extracted from the voids by a vacuum treatment followed by submersion of the metal body in the liquid. Any easily condensable vapor, such as steam, alcohol vapor or the like, may be used to displace the air from the voids and the metal object then submerged in the liquid.

At the conclusion of this step the voids in the metal are filled with the liquid. The impregnated article is then wiped dry and cured preferably by heating to a temperature of approximately 110° F. for a sufficient period of time to sweat out or remove that portion of the liquid which on hot days would be ejected onto the surface of the metal by thermal expansion. This step is of importance particularly in connection with articles of jewelry to prevent staining of clothing or other damage to objects which may come in contact with the liquid impregnated article.

This curing may be carried out in other ways. For example, the articles may be maintained under vacuum at room temperature or at a slightly elevated temperature until that portion of the liquid which is in the sub-surface area has been removed. Or the liquid may be removed from the sub-surface by maintaining the saturated objects in contact with absorbing liquids or solids.

As stated, the cross section of the pores or passageways in the metal are preferably made small to prevent excessive evaporation of the impregnant liquid. In some instances and with certain metals a satisfactory product is obtained without further treatment but we prefer to partially close the pores at the surface of the metal, so that the aggregate cross-sectional area, per unit area, of the voids at the surface will be less than the aggregate cross-sectional area, per unit area, of the voids, within the body of metal. This may be accomplished by burnishing, hammer or shot peening, surface rolling, spattering, spraying, porous electroplating, porous painting, lacquering or the like. This treatment not only prevents excessive evaporation of the impregnant but it

also prevents sweating caused by thermal expansion or gravity and results in a better lustre on the surface of the impregnated object.

While the impregnation of metal articles, such as jewelry, with a liquid capable of slowly evaporating at normal temperatures and pressures to furnish a pleasant odor in the atmosphere surrounding the metal object is an important aspect of the invention, the other uses mentioned above are also important. Thus, a metal object placed in a room where a disinfectant should be used may be impregnated with a suitable disinfecting liquid having the property of slowly evaporating at normal temperatures and pressures. Likewise, where it is desired to keep people or animals away from a given area, the structural metal elements enclosing the area may be impregnated with a liquid having a foul smell. Other specific uses of the invention are in the production of door knobs, telephone mouthpieces, etc. which are contacted by portions of a person's body or their breath. If such objects are impregnated with a suitable germicide, they will cause effective sterilization of disease germs. Examples of liquid impregnants which may be used for their disinfecting, sterilizing, germicidal or other insecticidal properties include phenol, cresol, hexylresorcinol, clove oil, tincture of iodine, and quaternary ammonium compounds such as the products sold under the trade names "Roccal" and "Zephryn." In the case of the use of such liquid impregnants, slow volatilization of the liquid not only maintains at the surface of the impregnated metal a fresh and active supply of the liquid but also imparts to the ambient atmosphere the volatilized amount of the liquid. Hence, for the purpose of practicing our invention, the liquid impregnant may be any liquid impregnant capable of slowly vaporizing at normal temperatures and pressures and having the desired characteristics. Other uses of the invention will be apparent to those skilled in the art.

This application is a continuation-in-part of our application Serial No. 137,491 filed January 7, 1950, now abandoned.

We claim:

1. A device for emanating vapors into a surrounding atmosphere comprising a porous metal body having interconnected voids communicating with each other and with the surface of the metal body, said voids being impregnated with a liquid impregnant capable of slowly vaporizing at normal temperatures and pressures, the aggregate cross-sectional area, per unit area, of the voids at the surface of the metal body being less than the aggregate cross-sectional area, per unit area, of the voids within the metal body to retard vaporization of the liquid impregnant within said voids.

2. A device as defined in claim 1 in which the voids constitute from about 5% to 45% of the volume of the metal body.

3. A device as defined in claim 1 in which the liquid impregnant is characterized by its ability to influence the organs of smell.

4. A device as defined in claim 1 in which the liquid impregnant is a perfume.

5. A device as defined in claim 1 in which the liquid impregnant is a pesticide.

6. A device as defined in claim 1 in which the liquid impregnant is a disinfectant.

7. A device as defined in claim 1 in which the liquid impregnant is a germicide.

8. A device for emanating vapors into a surrounding atmosphere comprising a porous metal body having interconnected voids communicating with each other and with the surface of the metal body, and a volatile liquid impregnant in the voids, except closely adjacent the surface of the metal body, the voids closely adjacent the surface of the metal body being substantially free of the liquid impregnant, the liquid impregnant being capable of slowly vaporizing at normal temperatures and pressures, the aggregate cross-sectional area, per unit area, of the voids at the surface of the metal body being less than the aggregate cross-sectional area, per unit area, of the voids within the metal body.

9. A device as defined in claim 8 in which the voids constitute from about 5% to 45% of the volume of the metal body.

10. A device as defined in claim 8 in which the liquid impregnant is characterized by its ability to influence the organs of smell.

11. A device as defined in claim 8 in which the liquid impregnant is a pesticide.

12. A device as defined in claim 8 in which the liquid impregnant is a germicide.

13. The herein described method which comprises forming a metal body having interconnected voids communicating with each other and with the surface of the metal, impregnating the voids of the metal body with a volatile liquid impregnant capable of vaporizing at normal temperatures and pressures, curing the body to remove liquid from the area closely adjacent the surface of the metal body and partially closing the voids at the surfaces of the metal.

14. The method described in claim 13 in which the curing of the body is obtained by heating it to a temperature of approximately 110° F.

15. The method as defined in claim 13 in which the liquid impregnant is characterized by its ability to influence the organs of smell.

16. The method described in claim 13 in which the liquid impregnant is a pesticide.

17. The method described in claim 13 in which the liquid impregnant is a germicide.

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