

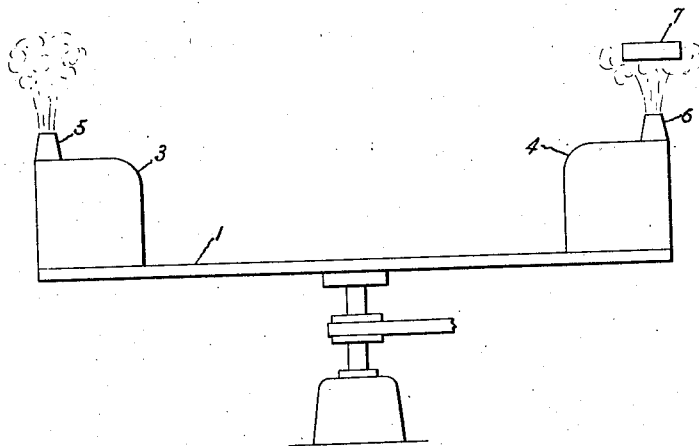
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LAMINATED METAL BODY

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LAMINATED METAL BODY

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2 Claims. (Cl. 91-70.1)

The present invention relates to laminated metal bodies and to a method of fabricating such bodies.

It is a particular object of the invention to provide a laminated structure of such nature that its cross-sectional surface may be utilized as an optical diffraction grating. It is recognized, however, that metals fabricated in accordance with the method described in the following are capable of other uses and it is intended to include such uses within the scope of the present disclosure and claims.

In applying the invention to the production of optical gratings, it is possible to produce a grating having a much higher number of lines per millimeter than is feasible with the methods used heretofore. The method by which this is accomplished includes producing on a basic surface a composite body or structure consisting of thin laminations deposited by a vaporizing process, the laminations being of a thickness on the order of, or less than, the wave length of light. In order to render such a body usable as a diffraction grating, it is desirable that the laminations consist alternately of a chemically inert material and a material which is capable of being attacked chemically. With this condition fulfilled, a given cross-section of the composite body may be cut and polished and afterwards etched. By this last step, the layers which are less chemically resistant manifest themselves as fine grooves which represent a line grating with a large number of lines per millimeter.

One arrangement by which the invention may be suitably carried out is illustrated in the single figure of the drawing and may be described as follows: On a horizontal metal disk 1 which is rotatably mounted on its axis two vapor jet crucibles 3 and 4 are secured in diametrically opposite positions. One crucible or vapor source has a jet 5 which discharges gold vapor, for example, and the other a jet 6 which discharges a less inert material such as silver vapor. Above the disk, which may be rotated at a desired speed around its vertical axis, a metal plate 7 adapted to condense the vapor is so suspended that the crucibles successively and repetitively swinging in a reentrant path past the surface of the plate create at each passing a very thin deposit of gold or silver as the case may be. By suitably proportioning the rate of vapor discharge, the distance between the crucibles and the plate, and the speed of rotation of the disk, it is possible to control the thickness of the individual stratified layers. It is entirely practicable to give the

layers a thickness comparable with the wave length of light so that as many as 1000 to 2000 layers per millimeter will be deposited.

As soon as the accumulated laminations have attained a thickness of, say, 2 millimeters, the composite body is cut vertically together with the supporting plate. The cut section is next polished and treated in a suitable manner until the surface is free of all distortions. If the polished surface is then etched chemically, the attack on the silver will be more pronounced than that on the gold, so that fine grooves or furrows are created. These grooves may be used for purposes of light diffraction in a manner well understood by those skilled in the optical arts. It should be pointed out that a grating produced in accordance with the foregoing method is especially suited for the spectral diffraction of electronic rays in which it is desired to separate electrons of a given velocity from those of differing velocities.

The cross-section of a stratified body of the type above described may be prepared as an optical grating by means other than by etching. For example, if the cross-section is ground and polished to a concave form, the relative displacement between the exposed edges of the various laminations will be sufficient to produce diffraction effects. Furthermore, instead of gold and silver as specified above, it may in certain cases be desirable to use other materials in the preparation of the laminated structure. For example, it may be advantageous in certain instances to use alternate layers of a metal and an insulator such as a salt. Such a combination may comprise, for example, layers of a salt of ammonium (e. g., NH_4Cl) alternated with layers of silver.

While particularly applicable thereto, the method described in the foregoing is not necessarily limited to the production of optical gratings. For example, it is possible to produce structural members having great strength and other unusual physical properties by the use of superimposed laminations of extreme thinness as specified in the foregoing. By using structural metals such as iron and aluminum, for example, instead of gold and silver, composite metal bodies may be obtained having characteristics entirely different from those which would result from direct alloying of these materials. Indeed, the type of fabrication outlined in the foregoing may be applicable in cases where alloying of the selected materials is impossible.

I aim in the appended claims to cover all uses

and modes of application of the invention which come within the true spirit and scope of the foregoing disclosure.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The process of depositing alternate layers of different solid vaporizable materials on a surface adapted to condense such materials which comprises providing separate sources of the materials, heating such sources to effect vaporization of the materials, and moving the sources along a reentrant path while continuing such

vaporization to bring the sources successively and repetitively into proximity to said surface.

2. The process of forming composite coatings by evaporation induced by heat which comprises providing separate sources of different solid vaporizable materials, heating the materials to effect vaporization thereof and moving the said sources orbitally about a common center to bring them successively and repetitively into proximity to a surface adapted to condense the said vaporized materials.

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