Patented Mar. 28, 1950 2,501,785

UNITED STATES PATENT OFFICE

2,501,785

ELECTRIC CURRENT RECTIFYING COUPLE AND PROCESS OF FORMING SAME

Charles R. Ogle and Paul B. Freeman, Indianapolis, Ind., assignors to Electronic Rectifiers, Inc., Indianapolis, Ind., a corporation

No Drawing. Application August 19, 1948, Serial No. 45,206

14 Claims. (Cl. 175—366)

1

This invention relates to electric current rectifiers and those suitable for the rectification of alternating current.

Such rectifiers broadly are old and well known in the art. Also their use and essential duty requirements are similarly well known. Rectifiers of this general type generally include a plurality of series or parallel disposed rectifying couples.

Heretofore in the art the yield of rectifier junctions suitable for use has been in the order of 70 to 80 percent. Also such rectifiers have the inherent tendency to deteriorate while standing (on the shelf).

The chief object of the present invention is to produce rectifier junctions wherein at least over 95 percent are suitable for use and wherein actually 99 to 98.5 percent have been suitable.

Another chief object of this invention is to produce a rectifier junction that has little or no deterioration upon standing.

A further object of this invention is to produce a rectifier junction that is at least as efficient electrically as those now common to the industry, although actually junctions embodying this invention are slightly more efficient electrically than those now commonly used.

The chief feature of the present invention resides in the use of certain materials and the handling thereof in such a manner that the foregoing objectives may be attained.

Other objects and features will be set forth more fully hereinafter.

Since rectifier couples may partake of many different outlines and each includes a pair of metallic or metallic compound plate-like members with film or band layer therebetween, and the article of the present invention is of this type, no illustration thereof is believed necessary.

Herein a layer of magnesium or magnesium alloy (usually predominately magnesium with the desired amount of manganese) and hereinafter designated magnesium body, and having the desired outline, is dipped into an iron sulphate solution, the concentration and temperatures of which may vary.

The pressures to be used in subsequent fabrication, the character of the surface to be coated, the thickness of the film and the desired electrical resistance constitute variables that determine within certain limits the ferrous sulphate solution concentration and temperaure. Which of the subsequent drying steps specified are employed also determines the concentration and temperature to be used. The duration of dip also determines film thickness.

2

Such dipping results in a film deposition comprised of iron oxide when dried in the presence of air containing oxygen. This drying may be by conventional air drying which, of course is somewhat variable due to room temperature and humidity variation. Controlled drying is preferred because in this manner the film may be fully changed to iron oxide in the shortest possible time consistent with physical requirements desired for such film. Such latter drying is usually in the presence of heated air or the like.

Associated with each body having thereon an intimate film of iron oxide is a copper sulfide or cupric sulphide body. This may be formed in any well known manner such as by subjecting heated copper washers to the action of sulphur vapors until the sulfiding of the bodies is completed. Such sulfided washers or bodies may be of the cuprous or cupric type, but preferably the latter, or also may be a cupric body with a thin cuprous contacting surface.

The two bodies are then placed together with the iron oxide film included therebetween. The desired pressure is applied and while maintained at a predetermined temperature the desired current is passed through the composite, compressed unit. The current is applied in so-called bucking or blocking relation that is from the magnesium body to the copper sulfide body. When the couple functions as a rectifier the current flow is the reverse of that just specified.

The duration and amount of current, pressure (voltage) temperature, etc., all are varied as required or desired. When such current treatment is completed it will be found that the two bodies are welded together with the iron oxide compounded to both and incorporated in and locked to the adjacent confronting surfaces of both bodies. The iron in the finished couple probably exists both as an oxide and a sulphide some of the oxygen being released to combine with the adjacent elements.

The resulting couple is now complete.

While the invention has been described in great detail in the foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A rectifying couple for an electrical rectifier,

comprising a copper sulfide body, a magnesium body, and a film of iron oxide therebetween.

2. A rectifying couple for an electrical rectifier, comprising a cupric sulphide body, a magnesium body, and a film of iron oxide therebetween.

3. A rectifying couple for an electrical rectifier comprising a copper sulfide body and a magnesium body homogeneously bonded thereto, said magnesium body having an iron oxide film thereon derived initially by subjecting the body to an iron depositing and oxidizing medium and disposed so as to be placed between the magnesium body and the sulphide body when the two bodies are associated together as a rectifying couple.

4. A rectifying couple for an electrical rectifier comprising a cupric sulphide body and a magnesium body having an iron oxide film thereon derived initially by subjecting the body to an iron depositing and oxidizing medium and disposed so as to be placed between the magnesium body and the sulphide body when the two bodies are associated together as a rectifying couple.

5. The method of forming rectifying couples for electrical rectifiers comprising forming upon a magnesium body a film of iron oxide by subjecting the body to an iron depositing and oxidizing medium, and then securing to that body in contact with the oxide film a copper sulphide body.

6. The method of forming rectifying couples for electrical rectifiers comprising forming upon a magnesium body a film of iron oxide by subjecting the body to an iron depositing and oxidizing medium, and then securing to that body in contact with the oxide film a cupric sulphide body.

7. The method as defined by claim 5 wherein the formation of the iron film is attained by dipping the magnesium body in an iron sulphate solution.

8. The method as defined by claim 6 wherein the formation of the iron film is attained by dipping the magnesium body in an iron sulphate solution.

9. The method as defined by claim 5 wherein the oxidization is at an elevated temperature and in the presence of heated air.

10. The method as defined by claim 6 wherein the oxidization is at an elevated temperature and in the presence of heated air.

11. The method as defined in claim 5 wherein the formation of the iron oxide film is attained by dipping the magnesium body in an iron sulphate solution and drying at normal ambient temperatures.

12. The method as defined in claim 6 wherein the formation of the iron oxide film is attained by dipping the magnesium body in an iron sulphate solution and drying at normal ambient temperatures.

13. The method of making rectifying couples for electrical rectifiers comprising forming upon a magnesium body a film of iron oxide by subjecting the body to an iron depositing and oxidizing medium, associating therewith a cupric sulphide body with the iron oxide film between the two bodies and under predetermined pressure and temperature, and passing an electric current through the compressed bodies in a manner to cause the iron oxide to combine with the adjacent bodies to form a homogeneous rectifying couple.

14. The method of making rectifying couples for electrical rectifiers comprising forming upon a magnesium body a film of iron oxide by subjecting the body to an iron depositing and oxidizing medium, associating therewith a copper sulphide body with the iron oxide film between the two bodies and under predetermined pressure and temperature, and passing an electric current through the compressed bodies in a manner to cause the iron oxide to combine with the adjacent bodies to form a homogeneous rectifying couple.

CHARLES R. OGLE.
PAUL B. FREEMAN.

No references cited.