July 23, 1940. R. E. POWELL 2,208,732

METHOD OF MAKING RIVETED ARTICLES

Filed July 27, 1937

FIG. 1.

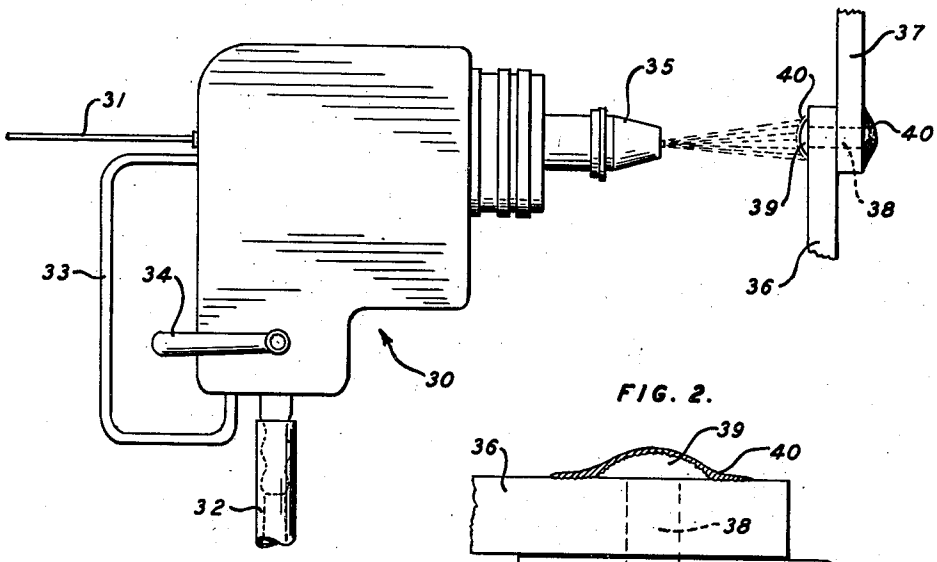


FIG. 2.

FIG. 3.

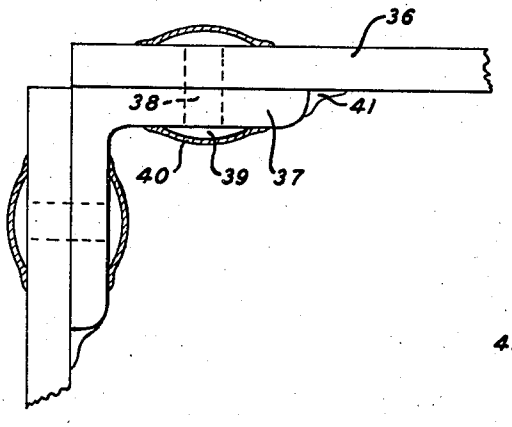
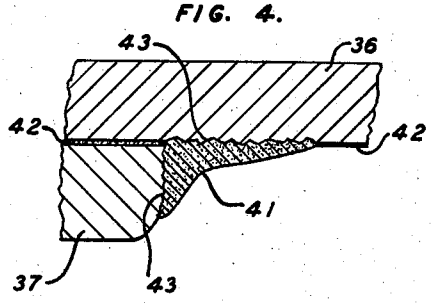


FIG. 4.



INVENTOR
R. E. POWELL

BY E. R. Nowlan

ATTORNEY

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METHOD OF MAKING RIVETED ARTICLES

Raymond E. Powell, Westfield, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

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4 Claims. (Cl. 29—148)

This invention relates to a method of making riveted articles, and more particularly to the securing of a pair of metallic members together by one or more rivets to form a structure having a high degree of electrical conductivity at the joint as well as mechanical strength.

In the manufacture of certain articles, such for example as metal frames and cabinets for the assembly and housing of various kinds of electrical devices and apparatus, and particularly where such frames or cabinets are made of aluminum, aluminum alloys, beryllium, alloys of beryllium, magnesium, zinc and their alloys, and the like metals which cover themselves in the air with a film of oxide, welded or soldered joints may be unsatisfactory for various reasons and riveted joints, while satisfactory as to appearance and mechanical strength may be unsatisfactory because of the more or less electrically insulating film of oxide between the riveted members.

An object of the present invention is to provide a method of making an article comprising riveted metallic members, and particularly members of or containing aluminum, beryllium, magnesium, zinc or the like, having satisfactory mechanical strength and electrical conductivity at the riveted joints.

With the above and other objects in view one embodiment of the invention contemplates a method of making an article which comprises steps of riveting two metallic members and of depositing a metallic crust or coating of metal over the rivet heads and over a portion of the surfaces of the members.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawing in which the same reference numerals are applied to identical parts in the several figures and in which

Fig. 1 is a view in side elevation of the formation of a crusted riveted joint in an article produced by the method;

Fig. 2 is an enlarged broken side view of a completed joint;

Fig. 3 is a side view of a modified form of joint, and

Fig. 4 is an enlarged sectional detail of Fig. 3.

In Fig. 1 there is disclosed a spray gun **30** used to convert a rod or wire **31** of metal into metallic spray for deposit as desired, and comprising a fuel supply duct **32**, a manipulating handle **33**, and a control **34**. The construction and mode of operation of this device are well known and no part of the present invention. Reference may be had, if desired, for a detailed description of a suitable device, to U. S. Patent 1,100,602, issued June 16, 1914 to Erika Morf.

An article in which a joint is to be made, has two metallic members **36** and **37**. These are first riveted together in the ordinary manner with one or more rivets **38** also of metal. Ordinarily, the members **36** and **37** and the rivet **38** are all of like material, although this is not always essential. Ordinarily also the invention is of value only where one or the other or both of the members **36** and **37** are of aluminum, beryllium, magnesium, zinc, or one of those alloys of these metals which is characterized by the spontaneous and swift formation upon any fresh surface exposed to the air, of a film of oxide, basic sulphide, sulphate, carbonate or the like which is closely adherent and electrically resistant.

The difficulties involved for example in making welded or soldered joints in aluminum and certain alloys because of the oxide film, are notorious. Analogous difficulties in the case of the other metals mentioned or certain of their alloys are almost equally great. Even where mechanically satisfactory welded or soldered joints are attained, their electrical character, as regards conductivity, may be deficient.

The joint having been mechanically made by riveting, the top of the formed rivet heads and an appropriate area of the surfaces of the members **36** and **37** about the rivet heads have their oxide coating removed and are slightly roughened. A suitable means for accomplishing this is by sand blasting, although other means may be used.

A crust **40** of metal is immediately sprayed or otherwise formed over the cleaned and roughened surface and built up to a sufficient thickness to endure probable future stresses. This crust **40** will ordinarily be of like material with the members **36** and **37** and the rivet **38**, although this is not essential.

It is found that, when a joint is thus riveted, cleaned and a crust immediately deposited as described, the crust becomes substantially one integral unit with the members **36** and **37** and the rivet **39**, providing perhaps negligible added mechanical strength to the joint but, nevertheless, a substantially integral and ordinarily homogeneous electrical path from the body substance of one member to that of the other.

Ordinarily, as stated, it is preferred that members **36** and **37**, rivets **38**, and crust **40** be of substantially like material to avoid problems of differential thermal expansion, thermoelectric and electrolytic potentials and the like, at the

joint. However, in some instances, it may be necessary to join members 36 and 37 of unlike substance, when the invention will still apply provided one of the members be of a self insulating material such as described. In such case, the rivet might be of like material with either member or unlike either; and the crust also.

While ordinarily it is preferred to include the step of sand blasting or otherwise cleaning the insulating film from the rivet head and adjacent area, it is found, in some instances, that this may be omitted when the spray gun is used to form the crust. It appears that in some cases the sprayed crust, while being formed, penetrates or breaks up the film and forms a satisfactory electrical continuity, although a continuity of no mechanical strength to speak of, this being provided by the rivet.

In Figs. 3 and 4, is illustrated a modification in which the encrusted rivet is electrically supplemented by an additional crust 41 deposited across another contact line of the two members. Fig. 4 is an enlarged detail section of the incrustation 41 shown in Fig. 3 together with its immediate surroundings. This figure being enlarged the oxide film is additionally indicated at 42, and the cleaned and roughened area at 43.

The embodiments of the invention herein illustrated are illustrative only and may be modified and departed from variously without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. The method of making an article having two members of highly oxidizable material such as aluminum, zinc or beryllium, which method comprises the steps of securing the members together with a rivet formed of the same material as the members to provide a mechanically strong union thereof, sand blasting the exposed surface of both rivet heads and of the members adjacent the rivet heads to roughen these surfaces to provide anchoring pockets for a sprayed coating of material and to remove from the said surfaces any oxide film then present, and forcing a heated material of the same substance as the members and rivet in spray form to coat the roughened surfaces therewith and cause particles of the sprayed material to pierce any oxide film formed on the roughened surfaces subsequent to the sand blasting thereof to form a continuous electrical path in like materials from one member through the integral coating, the rivet, the other integral coating and the other member.

2. The method of making an article having two members of highly oxidizable material such as aluminum, which method comprises the steps of securing the members together with a rivet formed of the same material as the members to provide a mechanically strong union thereof, sand blasting the exposed surface of both rivet heads and of the members adjacent the rivet heads to roughen these surfaces to provide anchoring pockets for a sprayed coating of material and to remove from the said surfaces any oxide film then present, and forcing a heated material of the same substance as the members and rivet in spray form to coat the roughened surfaces therewith and cause particles of the sprayed material to pierce any oxide film formed on the roughened surfaces subsequent to the sand blasting thereof to form a continuous electrical path in like materials from one member through the integral coating, the rivet, the other integral coating and the other member.

3. The method of making an article having two members of highly oxidizable material such as zinc, which method comprises the steps of securing the members together with a rivet formed of the same material as the members to provide a mechanically strong union thereof, sand blasting the exposed surface of both rivet heads and of the members adjacent the rivet heads to roughen these surfaces to provide anchoring pockets for a sprayed coating of material and to remove from the said surfaces any oxide film then present, and forcing a heated material of the same substance as the members and rivet in spray form to coat the roughened surfaces therewith and cause particles of the sprayed material to pierce any oxide film formed on the roughened surfaces subsequent to the sand blasting thereof to form a continuous electrical path in like materials from one member through the integral coating, the rivet, the other integral coating and the other member.

4. The method of making an article having two members of highly oxidizable material such as beryllium, which method comprises the steps of securing the members together with a rivet formed of the same material as the members to provide a mechanically strong union thereof, sand blasting the exposed surface of both rivet heads and of the members adjacent the rivet heads to roughen these surfaces to provide anchoring pockets for a sprayed coating of material and to remove from the said surfaces any oxide film then present, and forcing a heated material of the same substance as the members and rivet in spray form to coat the roughened surfaces therewith and cause particles of the sprayed material to pierce any oxide film formed on the roughened surfaces subsequent to the sand blasting thereof to form a continuous electrical path in like materials from one member through the integral coating, the rivet, the other integral coating and the other member.

RAYMOND E. POWELL.