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METAL MIXTURE

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9 Claims. (Cl. 113—112)

This invention relates to metal mixtures, and has special reference to metal mixtures for use in treating many, and perhaps all known, non-ferrous metals preparatory for the application of solder to attach together different sections of metals, or perform other soldering operations.

Objects of the invention are to provide a metal mixture that will function with a high degree of efficiency in removing from aluminum the surface film of oxide preparatory for the application of solder for any purpose; to provide an improved metal mixture for the uses to which it may be applied that will fuse at a comparatively low degree of temperature, say about 380° F., more or less; to provide a metal mixture that will condition the metal to be soldered so that, when the solder is applied, it will be characterized by a long extent of durability and will withstand the usually destructive salt spray tests; and to provide a metal mixture that will condition the metals to be soldered so that, when the solder is subsequently applied, it will possess great tensile strength which, in instances, has been found to exceed the strength of the metal itself.

Other objects will be apparent from the following description, it being considered that the proportions of the ingredients forming the mixture may be varied within the scope of tolerant ranges without departure from the nature and scope of the invention.

A satisfactory formula for the making of this metal mixture has been found to comprise the mixing together of powdered zinc metal, finely powdered virgin tin, and copper or salts of copper, together with suitable reagents. The fineness of comminution or granulation of these elements may be varied so long as they are comparatively fine. These elements of high grade may be mixed together satisfactorily in the proportions by weight of 85% zinc or zinc dust, 10% tin, and 5% copper or salts of copper, although ranges of tolerance have been found to extend from 80% to 90% of powdered zinc metal 1% to 15% of tin, and 1% to 5% of copper or salts of copper. These elements are used primarily because the zinc oxidizes only slightly on exposure to the air, the tin among other things makes the zinc less brittle, and the copper makes the mixture more ductile and rust-resistant.

After the zinc, tin and copper or salts of copper have been mixed together in powdered form, U. S. P. powdered ammonium chloride is added thereto in the proportion of from 30% to 50% by weight of the zinc, and thereafter U. S. P. granulated zinc chloride is added to the mixture in the proportion of from 5% to 15% by weight of the powdered zinc.

The ammonium chloride acts as a reagent to bring the melting point of the mixture of powdered zinc, tin and copper to a much lower degree than their regular melting point, and the zinc chloride acts mainly as a reagent, first to fuse the copper at the lower melting point to which it is brought by the ammonium chloride reagent and to liberate the oxygen, and then to hold said elements together while they fuse and form the ultimate alloy which completely amalgamates with the metals to be soldered under the influence of the heat. It is apparent that these reagents are used in approximately direct proportions to the proportions of the base metals specified.

When these elements are mixed together in the manner explained, they form a dry powder which is ready for use. However, the dry powder may be transformed into a paste by mixing therewith an appropriate amount of oil having a high flash point and low viscosity. The amount of oil required to form a paste can be observed during the mixing of the oil with the powder. I have found that an oil as nearly suited for this purpose as any now available is commercially known as Teresso No. 52, produced by the Standard Oil Company of New Jersey. Or, instead of forming a paste, the powder may be converted into liquid form by mixing therewith a sufficient amount of hydrochloric acid. The amount of hydrochloric acid required for this purpose can be determined by observation during the operation of mixing.

After the metal mixture has been formed in any manner thus described, the surface or surfaces of metals, especially aluminum, to which solder is to be applied are covered with a thin layer of the mixture, without first scoring or scraping said surfaces as has heretofore been necessary and common practice, and then the metal is heated to the degree, approximately 380° F. more or less, required to melt and fuse the mixture which is on the opposite side of the metal from the side to which the heat is applied; although the metal may also be heated electrolytically. In a very short time after the initial heat application, the mixture melts and fuses and cuts or eats in and under and detaches the surface film of oxide from the metallic surfaces to be treated. While the alloy thus formed by the mixture is still in this fused or molten state, it should be slightly scraped and puddled to effect clean contact thereof with the surfaces of the metals in order to remove all oxide films or dross before the solder is applied. Then immediately, while the metal remains heated to the degree indicated, or thereafter when the metal is reheated, any suitable solder can be applied upon the conditioned surface or surfaces of the aluminum or other metals, and will form therewith a very strong and durable union of great tensile strength. It is believed that the treatment of the surfaces to be soldered by this metal mixture

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in the manner described modifies the surface structure of the aluminum or other metal so that, when the solder is applied thereto, a new metallic joint or union is formed between the solder and the other metal. Actual experiments disclose that the resulting joint is analogous to a welded joint.

I have found by actual laboratory tests, that relatively thin sections of aluminum sheets soldered together in this way, show that the tensile strength of the soldered joints is stronger than the tensile strength of the aluminum sections proper. Also, photomicrographs of the contact between the solder and aluminum sheets, when magnified 750 times, show perfect bond and no discontinuity between the metals.

The proportions of the elements forming the mixture may be varied otherwise than as specifically mentioned without departing from the invention, so long as the efficiency of the ultimate alloy is not diminished. And other ingredients may be added without departure from the invention if the efficiency of the ultimate alloy is not diminished thereby.

I claim:

1. A metal mixture for removing film from metal surfaces preparatory for subsequent application of solder directly on said surfaces comprising a mixture by weight of approximately 80% to 90% powdered zinc metal, 1% to 15% powdered tin, and 1% to 5% powdered copper, and reagents having a lower melting point than said metals mixed therewith to lower the melting point of said metals and to fuse the metals at the temperature at which they are melted, respectively.

2. The method of removing surface film from aluminum for subsequent application of solder directly on the aluminum consisting in placing on the aluminum and surface film a mixture composed of approximately 80% to 90% powdered zinc metal, 1% to 15% powdered tin, and 1% to 5% powdered copper, and reagents lowering the melting point of said metals and fusing the metals when melted, heating the aluminum to melt the mixture on the aluminum, and then causing the melted mixture to suspend the film substance, and removing the residue mixture together with the oxide film and dross from the surface or surfaces to be soldered while said surface or surfaces are still heated about to the same degree as before.

3. A mixture of metals for removing surface film of oxide from metal surfaces preparatory for subsequent application of solder directly on said surfaces comprising a mixture by weight of approximately 80% to 90% powdered zinc metal, 1% to 15% powdered tin, 1% to 5% powdered copper, powdered ammonium chloride in the proportion of 30% to 50% by weight of the zinc, and granulated zinc chloride in the proportion of 5% to 15% by weight of the zinc.

4. A mixture of metals for removing surface film of oxide from metal surfaces preparatory for subsequent application of solder directly on said surfaces comprising a mixture by weight of approximately 80% to 90% powdered zinc metal, 1% to 15% powdered tin, 1% to 5% powdered copper, sufficient ammonium chloride to lower the melting point of said zinc, tin and copper to a much lower degree than their regular melting point, and a sufficient quantity of zinc chloride to fuse the metals at the lower melting point to which they are brought by the ammonium chloride.

5. The method of making a mixture of metals and salts for removing oxide film from aluminum surfaces preparatory for subsequent application of solder directly on said surfaces consisting in mixing together by weight approximately 80% to 90% powdered zinc metal, 1% to 15% powdered tin, and 1% to 5% powdered copper, and adding thereto powdered ammonium chloride in sufficient proportion to bring the melting point of the mixture of zinc, tin and copper to a much lower degree than their regular melting point, and a sufficient quantity of granulated zinc chloride to fuse the metals at the melting point to which they are brought by the ammonium chloride and to hold said metals together while they amalgamate under the influence of heat.

6. A metal mixture for removing oxide film from metal surfaces preparatory for subsequent application of solder directly on said surfaces containing 80% to 90% of powdered zinc, 1% to 15% of tin, 1% to 5% of copper, ammonium salts in the proportion of 30% to 50% by weight of the powdered zinc, and zinc salts in the proportion of 5% to 15% by weight of the powdered zinc, to lower the melting point of the minerals and fuse the metals at the lower temperature at which they are melted respectively.

7. A method of removing surface film from aluminum for subsequent application of solder directly on the aluminum consisting in applying to the aluminum a mixture of metals and reagents composed of approximately 80% to 90% of powdered zinc metal, 1% to 15% of powdered tin, 1% to 5% of powdered copper, ammonium salts in the proportion of 30% to 50% by weight of the powdered zinc, and zinc salts in the proportion of 5% to 15% by weight of the powdered zinc, then heating the aluminum to melt and fuse said mixture, and then causing the molten mass to suspend the film substance and dross and removing all the oxide film and dross from the surface or surfaces to be soldered while said surface or surfaces are still heated up to the degree of temperature at which the mixture became fused.

8. A metal mixture for removing film from metal surfaces preparatory for subsequent application of solder directly on said surfaces composed of powdered zinc, tin and copper within the ranges of 80% to 90% of powdered zinc, 1% to 15% of tin, and 1% to 5% of copper, in combination with salt reagents lowering the melting point of said metals and fusing the metals at the lower temperature at which they are melted, respectively.

9. A metal mixture for removing film from metal surfaces preparatory for subsequent application of solder directly on said surfaces composed of 80% to 90% of powdered zinc, 1% to 15% of tin, and 1% to 5% of copper, all of said percentages being by weight, in combination with a sufficient amount of ammonium chloride lowering the melting point of said metals to approximately 330° F., and a sufficient amount of zinc chloride to fuse said metals when melted and hold them together during amalgamation.

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