Nov. 18, 1952 N. C. PARRISH 2,618,572

METHOD FOR IMPACT PLATING

Filed Nov. 25, 1950

Fig. 1

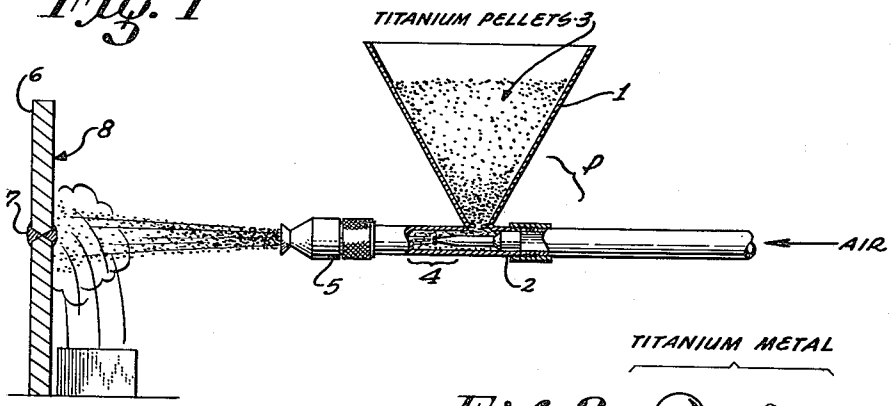


Fig 2

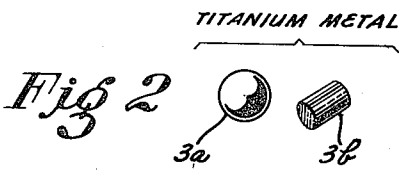


Fig. 3

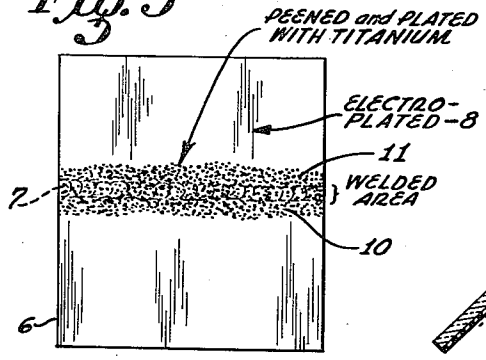


Fig. 4

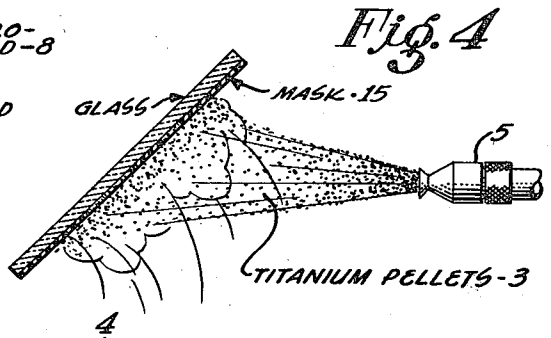
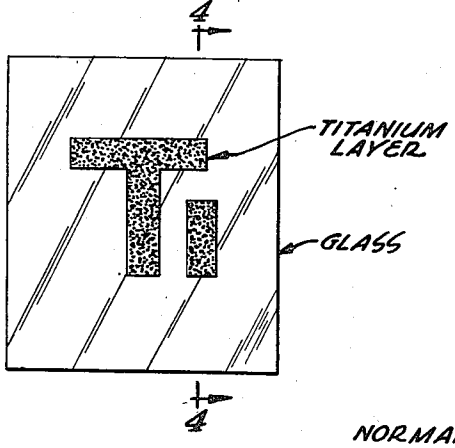


Fig. 5



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METHOD FOR IMPACT PLATING

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1 Claim. (Cl. 117—31)

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My invention relates to impact plating, and, more particularly, to a novel method of depositing an adherent layer of corrosion resistant metal upon a base material.

This application is a continuation-in-part of my prior application, Serial No. 160,609, filed May 8, 1950, and entitled "Electrical Conductors."

In said application, I have shown, described and claimed a means and method for friction bonding a titanium trace to harder materials, such as glass, quartz, ceramics and hard metals, for example. In this process, a tool of metallic titanium is pressed against a smooth surface of a material harder than titanium, and moved along this surface while the pressure is maintained to transfer titanium from the tool to the surface. The trace so formed is securely bonded to the surface. The term "friction bonding" was used to describe this process. The present invention is also concerned with bonding titanium metal to harder materials, and while the basic bonding principle is apparently the same, the means and method involved in the present invention are completely different.

It is an object of the present invention to provide a method of plating hard materials with an adherent layer of titanium metal.

It is another object of the invention to simultaneously shot peen and plate a hard material.

It is another object of the present invention to shot peen selected areas of metals and simultaneously, and as a result of said peening, to cover the peened area with a layer of titanium firmly bonded to the peened surface.

The invention includes the use of pellet projecting apparatus in which the projectiles comprise pellets of titanium metal. These pellets can be projected, as by an airblast or centrifugal force, against a surface of a material harder than titanium, such as glass, quartz, ceramic and metal, for example. If the material being impacted by the titanium pellets is such as can be shot peened, and where shot peening is desirable, such peening can be accomplished. The impacts, however, can be regulated, if desired, so that the peening action is small. In any case, however, each titanium pellet, upon impacting and glancing off the base material, will leave thereon a small trace of titanium firmly bonded thereto. Such traces, by repetition and by change of area covered, can be made to form a continuous titanium layer or plate over the area being treated. In this respect, it is pointed out that subsequent titanium traces will bond to a

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previous trace equally as well as to the base material itself. On smooth, polished surfaces, the traces and the layer formed may be wholly friction bonded. On rough surfaces a combination of friction bonding and filling of depressions by a scraping action may take place. In any event, I desire to call the process of the present invention "impact plating."

The process of the present invention, in the form by which shot peening and impact plating is simultaneously accomplished, is, for example, useful in the conditioning of welds made in metals where the parts welded are protected from corrosion as by an electroplated layer, the resultant weld being subject to corrosion. The shot peening will improve the physical characteristics of the weld and the resultant titanium layer will bridge the gap between the plated portions, thereby providing corrosion resistance over and across the weld area and neighboring parts areas from which the original plating may have been removed by heat.

Where peening is not used, the process of the present invention is well adapted to produce selected titanium plating of glass sheets, for example, by masking such portions of the glass where plating is not desired, and then projecting titanium pellets at the exposed glass surfaces. In this case, it is sometimes found desirable to place the surface to be plated an an angle to the lines of travel of the pellets so that obtuse angle glancing blows will be made by the pellets on the surface to be plated. In this way a minimum of peening impact with a maximum of plating impact will be provided.

My invention will be more adquately understood by reference to the drawings, in which:

Figure 1 is a schematic drawing of an airblast apparatus set up to shot peen and plate a weld by projecting titanium pellets there against.

Figure 2 is a diagram showing two types of titanium pellets used in the system of Figure 1.

Figure 3 is a diagrammatic plan view of a peened, plated weld.

Figure 4 is a diagram showing how a glass sheet can be selectively plated with titanium.

Figure 5 is a plan view of a glass sheet as plated by the arrangement shown in Figure 4.

Referring first to Figures 1, 2 and 3, a pellet projecting device P is utilized. As illustrated, the device P includes a hopper 1 mounted on an airpipe 2. Hopper 1 is adapted to hold a plurality of titanium pellets 3 so that they will pass by gravity into a mixing section 4 from whence the pellets are carried by air to a nozzle 5 to be pro-

jected into space at high velocity, dependent upon air pressure, nozzle size and pellet dilution, etc., as is well known in the sand blasting and shot peening art. The pellets may be in the form of shot 3*a* or cut wire 3*b* as shown in Figure 2. The pellet projecting device shown is meant to be illustrative only of a means by which the titanium pellets may be projected into space. Other devices providing similar results, such as a centrifugal force type of pellet projector, are deemed fully equivalent for the purpose of practicing the method of the present invention.

In front of nozzle 5 in a position to be impacted by the projected titanium pellets is a work piece 6, such as steel plates just having been attached by a weld 7. The impacted surface is in this instance substantially at right angles to the average line of pellet projection. The steel plates, for example, may have been provided with a surface 8 electroplated, such as with chromium, to provide corrosion resistance. Due to the heat of the weld, this plating will be burned off the work piece adjacent the weld line. The titanium pellets, by impacting the weld area and adjacent areas of the work piece, will shot peen the weld. At the same time, each impact of the pellets will cause a trace of titanium metal to be transferred to the work piece, either directly on the steel, or on a titanium trace previously deposited. The titanium traces will be friction bonded to the steel and to the previously deposited titanium traces, and by proper manipulation of nozzle 5 the entire weld and the areas adjacent denuded of electroplate will be covered with a titanium plate. Thus the weld and adjacent areas will be provided with a layer of corrosion resistant titanium at the same time the weld is being shot peened. The end result is shown in Figure 3 where the weld 7 and adjacent areas 10 and 11, denuded of the electroplated layer 8 by heat, are covered with a layer of titanium metal during peening.

When it is not desired that peening occur, a set-up as shown in Figure 4 can be used to produce a titanium plate.

Here, nozzle 5 is used to project a spray of titanium pellets 3 as in the set-up shown in Figure 1. The work piece 6*a* in this case may be a glass plate, for example, having a mask 15 applied to one surface thereof in the same manner as for regulating sand blast etching of glass.

This glass plate is then placed in the jet of titanium pellets, preferably at an obtuse angle to the lines of projection of the pellets. When the pellets hit the mask 15 they do not affect the glass. However, when the pellets hit the exposed

glass plate surface and bounce off, they leave a streak of titanium impact bonded to the smooth glass surface. By multiple contacts, the areas of the plate surface not masked are covered with a continuous bright plating of titanium metal solidly bonded thereto. Upon removal of the masking, the plated areas will show the pattern desired, as shown in Figure 5. In the same manner metals can be plated in whole or in part without surface deformation.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claim.

What is claimed is:

The method of plating a surface of a material harder than titanium with a thin adherent coating of titanium, without appreciable deformation of said surface, which comprises the step of: projecting a spray of titanium pellets against said surface with the axis of said spray at an angle to said surface substantially different from 90°, and thereby applying a component of said spray in a direction parallel to said surface whereby there is secured a maximum plating effect, and a minimum deformation of the surface by impact of the pellets.

NORMAN C. PARRISH.

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