March 27, 1945. F. W. HAMPSON 2,372,488

ELECTROPLATING PROCESS

Filed July 20, 1942

Fig. 1.

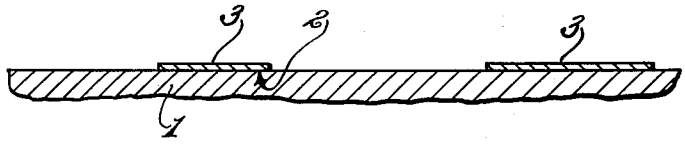


Fig. 2.

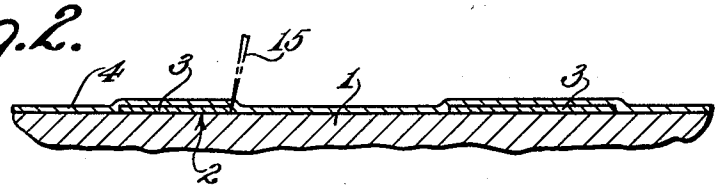


Fig. 3.

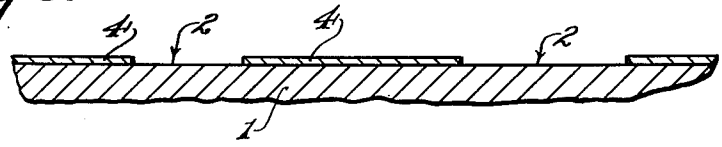


Fig. 4.

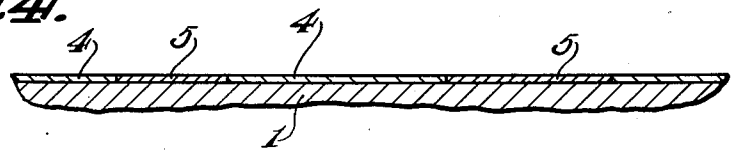
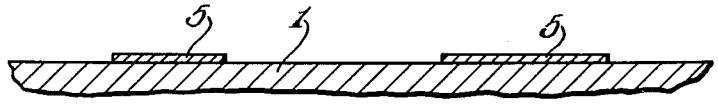


Fig. 5.



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Patented Mar. 27, 1945

2,372,488

UNITED STATES PATENT OFFICE

2,372,488

ELECTROPLATING PROCESS

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Application July 20, 1942, Serial No. 451,532

1 Claim. (Cl. 204—15)

This invention relates to a process for electroplating a surface in a localized area or areas and has for its object the provision of a method which will be both efficient and economical in applying the plate. While the invention possesses advantages in the solution of a wide variety of problems connected with the plating of different metals, the application of the same to the industrial uses of chromium plate will be found of special utility and will be hereinafter more particularly described.

As is well known, chromium plate, in addition to its function of ornamentation, is employed to produce an extremely hard finished wear surface for metal parts of machinery, tools, fixtures, gauges, etc. Such a plate also frequently serves as a build-up to increase thickness of a surface which has worn down or which for some reason or other has been reduced below the minimum dimension required. For this latter purpose, the precision specifications of the finished part make it desirable that the chromium plate shall be applied with great exactness, both as to area and thickness. The present invention thus has for its object more particularly what may be called a prevision application of electroplating to localized areas of a surface.

The preferred manner in which the invention may be carried out will be described in connection with the accompanying drawing which diagrammatically illustrates several steps in the process. It should be understood that the thickness of the shields and of the plate is greatly exaggerated for purpose of illustration.

Fig. 1 is a view in section of part of a piece having a surface to be plated and in which the first step of applying the weak adhering protector shield is shown;

Fig. 2 is a similar view of the next step in which the strong adhering resist shield is applied overall;

Fig. 3 is a similar view in which the protector shield is peeled off, carrying with it a counterpart of the resist shield and exposing the unshielded areas for plating;

Fig. 4 is a similar view showing the plate applied to said unshielded areas;

Fig. 5 is a similar view of the finished product after the remainder of the resist shield has been removed.

The first step of the process consists in applying to the particular area to be plated a shielding material or substance which will but weakly adhere to said surface and which, for being removed, may be lifted off or peeled off in more or less intact form. In preparation for this initial step the area to be plated should be preferably cleaned, which may be done mechanically by a suitable abrasive on a polishing wheel or otherwise. Various materials may be employed for this weak adhering shield, viz., ordinary adhesive tape, an adhesive cellophane, or similar material, or preferably a fairly quick-hardening lacquer which may be applied in any of the usual ways for such material, such as by brushing, dipping, or spraying. This weak adhering shield of the first step need not be of an electroplating resist character, as it merely serves as a physical protective covering for excluding the resist shield from the area to be plated and to lift off the superposed portion of the resist shield which is subsequently applied.

Referring to Fig. 1 of the drawing, a portion of the piece to be plated is indicated at 1, the localized area of said piece upon which the chromium plate is to be confined is indicated at 2, and the weak adhering shield is indicated at 3. A pyroxylin lacquer, fluid enough to be painted on, and weakly adhering to steel, iron, and other metals, will serve for this purpose. The particular lacquer which I use for the weak adhering shield 3 is vinyl polymer chloride resin dissolved in butyl acetate. To this is preferably added a coloring material so that the protector shield can be seen beneath the transparent resist shield. It should be understood, however, that various other equivalent materials having the characteristics named may be employed for this purpose. After applying said first shield or lacquer 3 it is carefully trimmed if necessary so its edges coincide precisely with the border edges of the area 2 to be protected.

The second step of the process is to apply overall—that is, over the entire surface of the part which is to be later subjected to the electroplating bath—the strongly adhering resist lacquer indicated on the drawing at 4. This overall coating step is suitably performed by dunking the piece into a bath of such resist lacquer. By resist lacquer is meant one that will resist all action of the electroplating bath and which will shield the surface covered thereby from such action. As before stated, it should be strongly adhering to the metal or other surface which it is designed to shield, so that chromic acid or other active agents in the electroplating bath or subsequent acid cleaning baths will not be able to work underneath the edges of the same. Such strong adhering resist lacquers are well known in the chromium plating art. The particular lacquer or

shield preferred for use in this second step is a transparent lacquer of nitro-cellulose base.

The third step is to peel or strip off the weak adhering shield of protective lacquer indicated by 3 in the drawing. In preparation for this operation it is desirable to employ a sharp instrument such as a razor blade for cutting down through the resist lacquer 4 around the bordering edges of the protective lacquer 3, as indicated diagrammatically by the numeral 15. Thereupon, an edge of the shield 3 may be lifted by the insertion of the sharp instrument thereunder to start the peeling off operation. When the shield 3 is completely peeled off it carries with it an overlying counterpart of the resist shield 4 and exposes the bare surface 2 of the metal to be plated, as illustrated in Fig. 3.

Before being plated, the surface 2 thus exposed should be clean and free of dirt and foreign particles left from the shield coating 3, particularly. This condition will prevail automatically if said shield coating material has been properly chosen. But if the surface 2 is not clean, it may be made so by further mechanical cleaning or by washing the same in weak acid.

With the surface 2 in clean condition the piece is then subjected, in the usual manner, to the action of the electroplating bath for the deposition upon said surface of the desired chromium plate. The resist shield 4 will of course prevent the deposit of chromium upon other parts of the surface than the part 2. Due to the sharply defined border edges of said part surface 2, its area may be accurately determined and consequently, by proper, well known control of the electroplating action, an exact predetermined measured thickness of plate may be deposited on said surface 2, said plate being indicated at 5. This is of importance both in avoiding waste of plating material and also, as compared with former methods of plating, in avoiding the necessity of further finishing operations for the plated piece.

The final step of the process is the removal of what remains of the resist lacquer 4, which may be accomplished in any suitable manner, either mechanically or by a suitable solvent. The finished product is illustrated in Fig. 5.

As shown in Fig. 3, the resist lacquer 4 provides straight side walls at the bordered edges of the exposed metal surface 2 and these side walls of the resist form a pocket-like recess for the plate deposited on said surface 2, whereby the side edges of the finished plate are straight and vertical, as shown in Fig. 5. As previously described, the plating 5, because of its known and controlled area, can be made with a very exact predetermined thickness so as to give the dimension desired, without the necessity of a grinding or further finishing operation.

It is to be understood that the present disclosure of my process with its detailed description is for purposes of illustration and example, and that the invention includes all modifications and equivalents which fall within the scope of the appended claims.

What I claim is:

In an electroplating process, the method of confining the deposit of plate to a localized area of the surface to be treated which consists in applying to said localized area a relatively weak adhering shield of colored material so as to cover the same exactly, then immersing said entire surface in a strongly adhering resist material of such character as to form on said surface a shield of a transparent material which will be unaffected by an electroplating action and through which said underlying shield of colored material may be seen, cutting through the second named shield around the bordering edges of said first named shield, then stripping off said first-named shield in a manner to carry off with it an exact counterpart of the superposed second-named shield, then subjecting said surface to the action of an electroplating bath for the deposit of metal upon the unshielded area of said surface, and finally removing from said surface the remainder of said second-named shield.

FREDERICK W. HAMPSON.