Nov. 9, 1943. P. C. WOOTERS 2,334,054

PLATING METAL FASTENERS

Filed Oct. 27, 1939

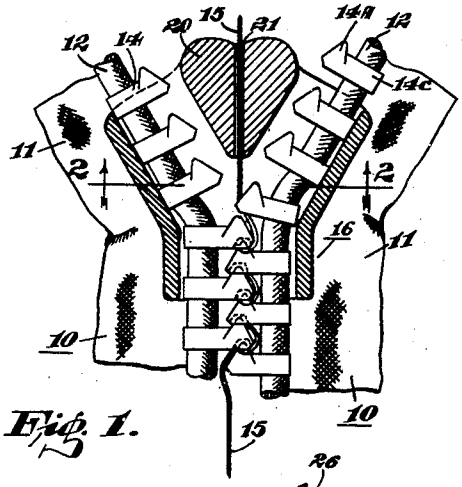


Fig. 1.

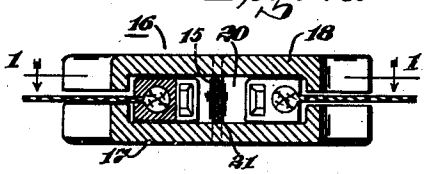


Fig. 2.

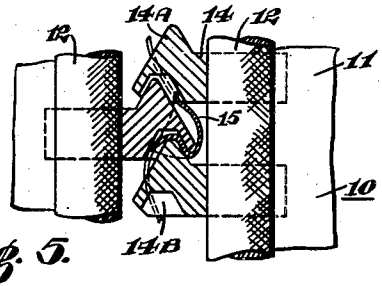


Fig. 5.

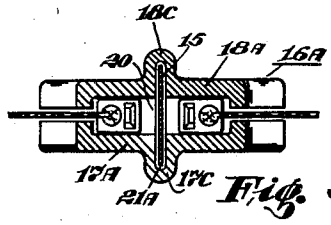


Fig. 3

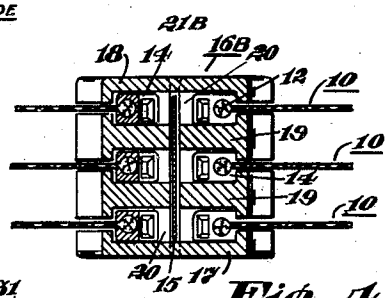


Fig. 4.

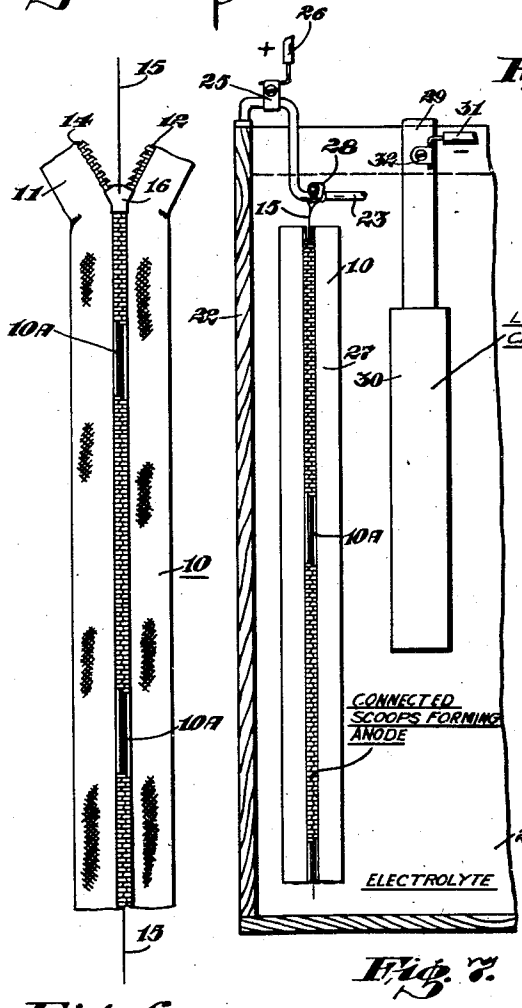


Fig. 7.

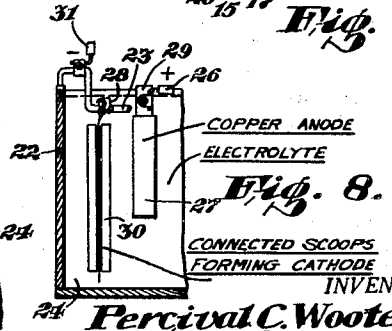


Fig. 8.

Fig. 6.

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PLATING METAL FASTENERS

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3 Claims. (Cl. 204—23)

This invention relates to the plating, coloring and otherwise coating of slide fasteners by electrolytic means wherein the stringers comprise suitable supporting tapes having thereon interengageable metal fastener members or scoops.

It is an object of this invention to provide a method to obtain a continuous electrical contact for electrolytically plating, coloring or otherwise coating the interengageable scoops or fastener members of slide fasteners after their attachment to stringer tapes. This method employs the use of a metallic foil of such thickness and size as to meet whatever current carrying requirements may be necessary for any particular electrolytic treatment. The use of this foil provides a distinctly separate and external means of furnishing a continuous contact along the fastener members or scoops, as distinguished from previous methods wherein the plating, coloring or otherwise coating of the fastener members or scoops was accomplished prior to their attachment to the stringer tapes or else had the contacting means incorporated in the fastener itself through the use of wire bearing tape or cord.

It is a further object of this invention to provide a method wherein uniformity of plating, coloring or otherwise coating of fastener members or scoops is secured because of attainment of uniform and positive electrical contact between the respective fastener members or scoops in fastener stringers and between the respective fastener members or scoops and the electrolyte or solution in which the plating is carried out.

It is a further object of this invention to provide such a method which embodies ultimate economy because of the utilization of low cost metal foil to provide the above described uniform electrical connection between the respective fastener members or scoops and the electrolyte or solution in which the electrolytic process is carried out.

It is a further object of this invention to provide such a method wherein the provision of the electrical connection between the fastener members or scoops and the electrolyte is achieved through th utilization of the above described low cost metal foil without, in any way, reinforcing or modifying the scoop supporting stringer tapes or impairing the flexibility thereof.

It is a further object of this invention to provide such a method wherein the relationship between the stringer tape and attached fastener members or scoops is unaffected and undisturbed and wherein the necessity for the application of overstretching stress to the stringer tapes is totally avoided.

It is a further object of this invention to provide a method particularly adapted to anodized coating and subsequent dye coloring of slide fastener scoops or fastener members and wherein it is possible to secure complete uniformity of coloring of the respective fastener members or scoops in the fastener stringers.

These and other objects of the invention will appear from the following description taken in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a fragmentary view illustrating, in plan, the pulling up between cooperating slide fastener stringers of the metal foil utilized according to this invention, which metal foil is guided by the foil guiding slider tool shown in section, as indicated by the line 1—1 in Fig. 2;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a view, similar to Fig. 2, of a modified form of foil guiding slider tool;

Fig. 4 is a view, similar to Fig. 2, but illustrating a multiple foil guiding slider tool constituting a second modification of the foil guiding slider tool illustrated in Figs. 1 and 2;

Fig. 5 is an enlarged fragmentary detail of Fig. 1 with fastener scoops and interengaged metal foil shown in section;

Fig. 6 is a fragmentary plan view showing a metal foil strip pulled up between cooperating gap spaced stringers of fastener chain according to this invention;

Fig. 7 is a fragmentary, diagrammatic view illustrating the application of the principles of this invention to a fastener coloring process involving anodic oxidation; and

Fig. 8 is a view, similar to Fig. 7, but illustrating the application of the principles of this invention in treating a slide fastener by electrolytic color plating process.

Formerly, in order to secure desired uniformity of plating, color plating, and particularly anodic coating in slide fasteners, it has generally been found necessary either to treat the fastener members or scoops electrolytically prior to their attachment to the reinforced edges of slide fastener stringer tapes or to incorporate in the stringers, in association with the tapes and attached fastener members or scoops, means providing electrical contact between the fastener members or scoops of the stringers. These practices were followed in order to secure uniformity of plating, coloring or coating and subsequent color between

the respective scoops or fastener members in each stringer and between complimentary stringers of slide fasteners.

Where the plating, color plating or anodic coating was accomplished prior to attachment of the fastener members or scoops to the tapes, the electrolytically produced surfaces were subjected to contact with various mechanisms and tools required, subsequently, to secure them to the stringer tapes. This contact of these surfaces with the mechanisms and tools was accompanied, necessarily, by undesirable surface defacement.

While some attempts have been made electrolytically to treat the scoops or fastener members of slide fasteners by use of separate electrical contact providing means after their attachment to stringer tapes, the attempted methods have not been completely satisfactory because of the difficulty of securing uniform electrical connection between the adjacent scoops or fastener members and between the scoops or fastener members and the electrolyte or plating solution. Another method incorporating the application of stress to the stringer tapes in fasteners having the scoops or fastener members thereof engaged has, perhaps, been chief among the many formerly attempted methods, but such practice is accompanied by extremely undesirable overstressing of the stringer tapes whereby the relationship of the respective scoops or fastener members on the stringer tapes is modified in such manner as substantially to impair the utility of the stringers.

According to this invention, the above objections to prior known methods are obviated by the use of suitable metal foil which is pulled up between cooperating stringers of a slide fastener prior to surface treatment thereof. The metal foil provides substantially uniform electrical connection between the respective scoops or fastener members in the stringers of the fastener. This practice is applicable to various known electrolytic plating processes and is particularly adapted to anodic oxidation of metals wherein it is of prime importance that uniform anodizing of the scoops or fastener members should be secured.

In one such process, the following steps are carried out:

1. The metal scoops of an aluminum fastener are cleaned in a suitable manner.

2. The cleaned metal scoops are electrolytically anodized in a suitable electrolyte, i. e., subjected to anodic oxidation which forms a surface coating.

3. The anodized or anodically oxidized scoops are neutralized by rinsing with a suitable base, such as dilute ammonium hydroxide; and then thoroughly rinsed in clear cold water several times.

4. The rinsed fastener is immersed in a dye bath of the desired color and at the definite temperature and pH necessary for dyeing the anodized aluminum surfaces.

5. The color is sealed by treatment with nickel acetate, preferably by boiling the dyed fastener for approximately five minutes in nickel acetate solution.

In the above process, considerable difficulty has been encountered in step No. 2 due to the production, in this step, of non-uniform anodic coat on the respective aluminum scoops of the fastener. As the depth of color of the respective scoops is dependent upon the depth of the anodic coat, it is of extreme importance that the anodic coat formed on the scoop surfaces be uniform.

It is extremely important that the current carrying capacity of the conducting medium be high enough for the electrolytic process involved and by the use of this method, the necessary capacity is readily secured by varying the thickness and size of foil to meet a particular application. The depth of the anodically formed coating depends mainly upon (*a*) the time through which the scoop surfaces are subjected to anodic oxidation, and also (*b*) the current to which the respective scoops are subjected during anodic oxidation. It is, therefore, of prime importance that the current, which has formerly been the variable factor, be made uniform and invariable as between the respective scoops of the fastener in order that complete uniformity of color be secured in the fastener as a unit. By the use of metal foil as a connecting medium, common uniform electrical connection is secured between the respective scoops of fasteners, which connection is unaffected by the formation of anodic coatings, oxide color film or metallic plate.

The principles of this invention are also applicable to that method of electro-color plating wherein the scoops, which are formed of suitable metal or alloy, are subjected to an electrolytic treatment which forms a cuprous oxide film. These thin films cause light interference which produces a surface coloring having spectral properties. In this process, the following steps are carried out:

1. The metal scoops of the fastener are cleaned, in suitable manner, to remove dirt and foreign matter from the scoop surfaces.

2. The scoops are electro-color plated by electrolytic means while immersed in a suitable electrolyte of which one is comprised mainly of copper sulphate, Rochelle salts, etc., which bath contains an anode of copper. The scoops, which are electrically connected by a strip of copper foil, according to this invention, form the cathode. Extremely low voltages and currents are used, the voltage being preferably 1½ volts or less and the current being between 10 and 50 milliamperes. The thickness of the film depends mainly, of course, upon the time of the plating operation and also upon the current. Where such low current values are used, it is of extreme importance that substantially perfect electrical connection be secured between the respective scoops of the fastener in order to secure uniformity of film thickness through the fastener. The thickness of the film controls the spectral effects produced thereby, and any non-uniformity in the iridescent finish provided by this process.

3. The above electrical plating step is preferably followed by a lacquering step wherein a coating of clear lacquer is applied to the electro-color plated surfaces to preserve the finish. This, of course, has some slight effect upon the iridescent finish produced, but as the depth of the lacquer can be readily, carefully, controlled, then the depth of the plating film is controlled accordingly, the uniformity of film thickness being achieved by the use of metal foil to provide substantially perfect electrical contact between the respective scoops of the fastener during the electrolytic treatment described above.

The principles of this invention are applicable, also, as stated above, to all common plating processes wherein, by an electrolytic process, a fresh metal coating is deposited on the existing metal scoops of the fastener. Suitable metal foil is used, according to the principles of this invention, to secure substantially perfect electrical con-

tact between the respective scoops of the fastener, totally unaffected by deposit of plate. The current flow is uniform throughout the fastener and the thickness of the plating or metal film is also uniform throughout the fastener. Where such uniformity is secured, it is possible to secure complete coverage of the exposed scoop surfaces with a metal film of any desired slight uniform thickness, thus achieving a substantial economy of plating material.

From the above, it will clearly appear that the use of suitable metal foil, according to the principles of this invention, to secure uniform current flow in electrical plating, color plating, or anodic coating processes makes possible the electrolytic treatment of scoops or fastener members of slide fasteners after their attachment to the supporting fastener stringer tapes, which treatment was hitherto accomplished prior to the attachent of the scoops or fastener members to the supporting stringer tapes of the fastener, or by modification of the stringer tapes by imbedding current carrying means, such as wires therein. This latter procedure undesirably increased the rigidity, and reduced the flexibility, of the stringer tapes accordingly as the current carrying capacity of the wire and scoops was increased. This was extremely undesirable in many cases, and in particular where the fasteners were of the smaller sizes.

As illustrative of the principles of this invention, I have shown, and describe hereinafter, the use of aluminum foil pulled up between aluminum scoops or fastener members of a slide fastener to provide satisfactory uniform electrical connection between the respective scoops or fastener members of the fastener and between these scoops or fastener members and the electrolytic bath or solution in an anodic oxidation process.

I have also shown, and described hereinafter, the manner in which other metal foils are used with fastener members of other metals or alloys wherein, in the electrolytic processes, the cathode is formed by the scoops or fastener members and the electrically conducting metal strip pulled up therebetween.

As shown in the drawing, the slide fastener stringers, generally designated 10, comprise tapes 11, suitably reinforced at one edge 12 and having secured to this reinforced edge 12 in suitable spaced relationship, metallic scoops or fastener members 14. These scoops or fastener members 14, as shown in Fig. 5, have the head portions thereof formed with a projection 14a at one side and a pocket or socket 14b at the other side in order that they may be interengaged as shown. The opposite end portion or leg portion 14c of each scoop or fastener member 14 is of bifurcated form and is clamped over the reinforced edge 12 in known manner.

The stringers may be provided with gap spaces 10a as shown in Figs. 6 and 7, or the series of metal scoops or fastener members on tape, known as "chain," may be uninterrupted or continuous, there being no gap spacing provided in the stringers. In order that uniform electrical connection shall be provided between the scoops or fastener members of a fastener, a strip of metal foil 15 is pulled up between the scoops or fastener members 14 of the complementary fastener stringers 10 when they are connected, prior to being subjected to an anodizing or other plating step as shown in Figs. 1 and 5 to 8.

In order that this pulling up of the metal foil strip 15 between the complementary stringers of a slide fastener may be accomplished with utmost convenience, I have provided a new and improved foil guiding slider tool which is either of the single form illustrated in Figs. 2 and 3 and therein generally designated 16 and 16a respectively, or it may be of multiple form as shown in Fig. 4, wherein it is generally designated 16b.

In the single form illustrated in Figs. 1 and 2, the foil guiding slider tool is of the same general form as a conventional slide fastener slider save for the provision of a longitudinal foil strip guiding slot in the wedge or "diamond" thereof.

In detail, the tool illustrated in Figs. 1 and 2 comprises a pair of similar wings 17 and 18 provided in conventional manner with marginal side flanges and connected at their upper ends by a wedge 20 secured between the wings 17 and 18. This wedge 20 is centrally provided with a longitudinal strip guide slot 21. The strip guide slot 21 is preferably wider and thicker than the foil strip 15 which is desired to be pulled up between the cooperating fastener members or scoops 14 and the complementary stringers 10 in order to provide adequate clearance as shown in Figs. 1 and 2.

In order to pull up a metal foil strip between the cooperating stringers 10 of a slide fastener, it is merely necessary to dispose the fastener members 14 at the lower ends of the stringers 10 into the channel formed between the wings 17 and 18 in the tool 16 and to place a foil strip 15 between these scoops or fastener members 14 prior to their engagement. The strip 15, of course, projects upwardly through the strip guide slot 21 in the wedge 20. The strip guiding slider tool 16 is then pulled upwardly with respect to the stringers 10 and foil strip 15, or stringers with foil initially engaged are pulled down with respect to the strip guiding slider tool to secure the strip 15 in interlocking relationship between cooperating fastener members or scoops 14 as shown in Fig. 1.

The foil strip 15 is continuous, and for this reason, continuous electrical connection is provided by the foil strip 15 from one end of the fastener strip to the other end thereof, irrespective of the existence of gap spacing 10a in the respective stringers 10.

In order that substantial electrical connection of slight resistance be provided between the respective fastener members or scoops, it is preferable in many cases that the strip 15 extend substantially beyond the zone of contact with the scoops at one side, or, more preferably, at both sides. This is accomplished by the use of a strip guiding slider tool 16a of the modified form shown in Fig. 3 of the drawing. In this form, the tool is of the general form of that construction illustrated in Figs. 1 and 2 save for the extension of the channel formed by the strip guide slot 21 substantially beyond the scoops at each side.

This is accomplished by providing wings 17a and 18a, which are similar to the above described wings 17 and 18 save for the provision of integrally formed longitudinal channels 17c and 18c respectively which communicate with the sides of the slot in the wedge 20 to form a strip guide slot 21a, substantially wider than the thickness of the wedge 20 and capable, therefore, of accommodating a strip 15 of width substantially greater than the thickness of the scoops 14 as shown in Fig. 3.

While it is, perhaps, most preferable that the extension of the strip beyond the scoops take place at both sides, nevertheless, either one of the

channels 17c or 18c may be omitted without substantial impairment of the efficiency of electrical connection.

The degree of slot extension thus provided may, of course, be varied as desired by variation of the depth of either or both of the channels 17c, 18c. The above described procedure is followed in pulling up a strip 15 between the interengaged scoops of complementary stringers 10 with a strip guiding tool 16a.

The strip guiding slider tool may also be made of multiple form such as 16b, Fig. 4. Such tool comprises a plurality of units similar to the single unit of the tool of Figs. 1 and 2, which units are superposed and united. The slots extending through the respective wedges 20 communicate with one another to form a single strip guide slot 21b accommodating a strip 15 of such width as to be capable of being pulled up simultaneously between the scoops 14 of a plurality of pairs of fastener stringers 10 as shown in Fig. 4.

The end wings 17 and 18 are preferably of the form shown in Figs. 1 and 2 while the intermediate wings, designated 19, are provided with marginal side flanges at both sides. The number of units in this multiple strip guiding tool may, of course, be varied as desired.

In the use of the tool 16b, the above described procedure followed in pulling up the strip 15 between stringers 10 with the tool 16 and 16a is modified only in that a plurality of pairs of stringers 10, in superposed relation, are arranged in the channels between the wings of the multiple strip guiding slider tool and a single wide strip 15 of metal foil extending through the slot 21b is placed between the scoops 14 at the lower ends of the stringers 10 before they are engaged, during pulling up, by the multiple strip guiding slider tool 16b.

A substantial advantage of the use of metal foil to provide conducting connection between the scoops 14 of the fastener stringers during anodizing resides in the ability of the foil closely to engage the irregular surfaces of the head portions of the scoops. Such close contact is achieved that entry of the electrolyte between the strip and engaged surfaces of the scoops is prevented to such degree as to prevent, therebetween, the formation of any coat which would impair the electrical connection due to its non-conducting nature such as the oxide or hydroxide coating formed in aluminum anodizing, as illustrated in Fig. 7.

In Fig. 7, which is illustrative of the anodic oxidation of aluminum method first described above, the plating tank, designated 22, is of suitable non-conducting material. An electrical conducting bracket 23 is attached thereto, at the top, in such manner as to extend below the surface of the electrolyte 24 therein. A suitable electrolyte for this purpose is a 10% solution of sulphuric acid.

The positive wire 26 of the plating circuit is connected to the bracket 23 by means of the terminal 25. The anode 27 which comprises complementary stringers 10 having pulled up therebetween a strip 15 of aluminum foil, is supported by the bracket 23 to which it is electrically connected by winding of the tape 15 over the bracket 23 to which it is secured by suitable means, such as spring clamp 28. Also secured to the tank 22 is a conducting bracket 29 having the lead cathode 30 secured thereto and immersed in the electrolyte 24.

The negative wire of the electroplating circuit is connected to the conducting bracket 29 by means of the terminal 32. When current of suitable voltage and amperage is passed through the plating circuit which thus includes the anode 27, electrolyte 24 and cathode 30, for a suitable length of time, an aluminum oxide or hydroxide coating is formed on the surface of the scoops 14 which, with the strip 15, form the anode 27; and for the reason pointed out above, this coating is uniform.

In Fig. 8, which is illustrative of the second of the above described methods, the arrangement is the same as that illustrated in Fig. 7 save that the cathode 30 is formed by the stringers 10 and pulled up strip 15, which strip is of copper. The bracket 29 supports the copper anode 27, and the positive wire 26 is connected to the bracket 29 while the negative wire 31 is connected to the bracket 23 by the terminal 25. The electrolyte 24 is comprised of a suitable solution, such as one constituted mainly of copper sulphate, Rochelle salts, etc., and the plating current is preferably from 10 to 50 milliamperes at or below 1½ volts. Passage of current through the circuit including the copper anode 27, the electrolyte 24 and the cathode 30 (formed by the stringers and pulled up copper strip) deposits a thin cuprous oxide film which causes light interference and produces surface coloring having spectral properties. Because of the uniformity of electrical connection and consequent uniformity of film thickness, the color is uniform throughout the fastener.

From the above description it will clearly appear that the field of application of this invention is of wide scope, that it embodies economy and efficiency to a high degree and that the application of the principles thereof to the various methods of electrolytic plating, coloring or otherwise coating of slide fasteners with metallic fastener members or scoops constitutes a substantial and meritorious advance in the art.

It is, of course, to be understood that the above described structure is merely illustrative and in no wise limiting and that I desire to comprehend within my invention all modifications included within the scope of the appended claims.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a method of electrolytic surface treatment of fastener members of slide fasteners including nonconducting stringer tapes with spaced interengageable metallic fastener members thereon, pulling up between the fastener members of a pair of tapes a flexible conducting foil strip, immersing the assembled stringers and strip in the electrolytic bath of an electrolytic treatment apparatus, attaching the foil strip to a terminal of the apparatus to form an electrode of the electrolytic treatment apparatus, and passing current through the apparatus to secure surface treatment of the fastener members uniformly electrically connected by the conducting strip.

2. In a method of anodic surface treatment of fastener members of slide fasteners including nonconducting stringer tapes with spaced interengageable aluminum fastener members thereon, pulling up between the fastener members of a pair of tapes a flexible conducting aluminum foil strip, immersing the assembled stringers and aluminum foil strip in the electrolytic bath of an electrolytic treatment apparatus, attaching the foil strip to the anode terminal of the apparatus to form the anode of the electrolytic treatment

apparatus, and passing current through the apparatus to secure anodic surface treatment of the fastener members uniformly electrically connected by the foil strip.

3. In a method of electrolytic surface plating of fastener members of slide fasteners including nonconducting stringer tapes with spaced interengageable metallic fastener members thereon, pulling up between the fastener members of a pair of tapes a flexible conducting foil strip, immersing the assembled stringers and foil strip in the electrolytic bath of an electrolytic treatment apparatus, attaching the foil strip to the cathode terminal of the apparatus to form the cathode of the electrolytic treatment apparatus, and passing current through the apparatus to secure surface plating of the fastener members uniformly electrically connected by the foil strip.

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