Dec. 15, 1931. T. A. EDISON 1,836,066

ELECTROPLATING APPARATUS

Original Filed July 6, 1923

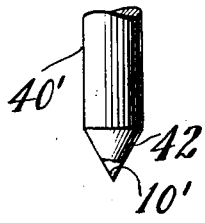

Fig. 4

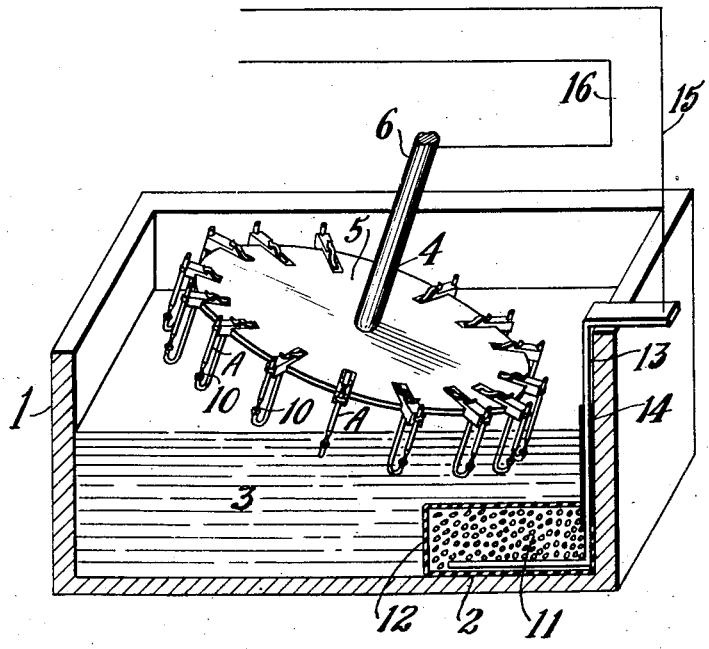

Fig. 1

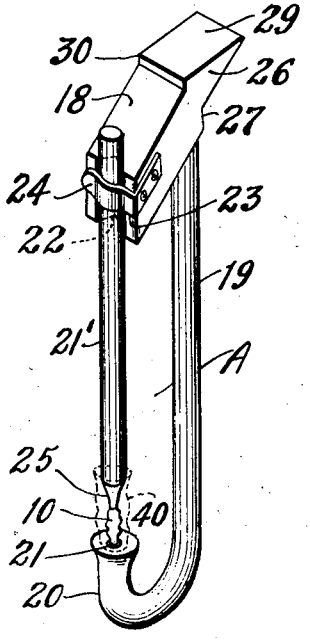

Fig. 2

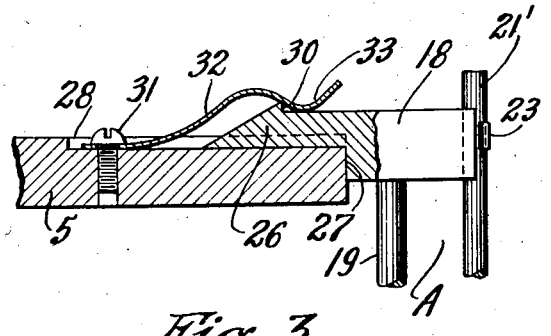

Fig. 3

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UNITED STATES PATENT OFFICE

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ELECTROPLATING APPARATUS

Original application filed July 6, 1923, Serial No. 649,826. Patent No. 1,600,722. Divided and this application filed August 14, 1926. Serial No. 129,110.

The present application is a division of my copending application, Serial No. 649,826, filed July 6th, 1923 and entitled "Mountings for diamonds and the like", which co-pending application has resulted in Patent No. 1,600,722, dated September 21, 1926.

My co-pending application, above referred to, describes and claims an improved form of mounting for diamonds and the like and to an improved method for producing the same. While the invention of said co-pending application is applicable to mountings for diamonds or the like, used for various purposes, such for example as various types of cutting, grinding and truing tools, such application specifically describes the invention as applied to mountings for phonograph styli formed of diamond or sapphire and in which the stylus is partially enclosed in a metal holder and projects from an end portion thereof.

In producing a mounting for a phonograph stylus formed of diamond, in accordance with the method described in my said co-pending application, a small piece of diamond of the proper size and shape for use as a phonograph stylus, is first thoroughly cleaned and is then preferably, though not necessarily, covered with a thin film of stannous chloride. A thin preliminary coating of conductive material, preferably in the form of a silver mirror, is then applied in any suitable manner to the diamond; this silver coating being just sufficient in thickness to provide a good conductive coating over the entire surface of the diamond. A large number of points or splints of diamonds or like are preferably simultaneously treated to the steps just described. Mountings for the silver coated diamonds are then preferably produced in situ by electro-depositing metal thereon to a sufficient thickness and then turning down and finishing the holders thus obtained and the diamond points embedded therein to the desired form. To this end the silver coated diamonds are preferably electro-plated first with very thin protective layers of metal, preferably nickle, as by placing the same in a nickel gauze basket constituting the cathode of a nickel plating cell, and impressing a current of very low density, preferably about .05 of an ampere, on the cell for a period of about five hours. The thin preliminary layers of electro-deposited nickel thus produced are very hard, tough and dense and are very firmly bonded to the diamonds. The diamonds are then electroplated with a final coating of metal, preferably nickel, of a sufficient thickness to form holders of the desired size in a suitable electro-plating apparatus or cell.

The invention of the present application relates to an improved electro-plating apparatus, which, while adapted to be used for various other purposes, is especially designed for use in connection with the production of mountings for diamonds or the like, as above described, for applying the final thick deposits of electro-plated metal on the diamonds after the thin coatings of conductive material and electro-plated metal have been applied thereto.

One of the objects of my invention is to provide an apparatus of the character described, which is simple in construction and effective in operation, to produce electro-deposited layers of nickel or other metal which are dense and free from air-holes.

Another object of my invention is to provide an electro-plating apparatus, such as described, having a novel and effective type of support or holder for the diamonds or the like to be plated.

Other objects and features of my invention will be hereinafter more specifically described and claimed.

In order that my invention may be more clearly understood, attention is directed to the drawings accompanying and forming a part of this specification and in which:

Figure 1 is a somewhat diagrammatic view in perspective, partly in section, of a preferred form of an electro-plating apparatus or cell embodying my invention;

Fig. 2 is an enlarged view in perspective of one of the holders or supports for a diamond or the like to be electro-plated and constituting a part of the cathode of the plating apparatus or cell shown in Fig. 1;

Fig. 3 is an enlarged detailed view, partly in section and partly in elevation, illustrating how each of the holders or supports for the diamonds to be electro-plated, is removably secured to the rotatably mounted member comprising part of the cathode of the electro-plating apparatus shown in Fig. 1; and

Fig. 4 is an enlarged fragmental view in elevation, of a completed mounting for a diamond or the like, produced as above described.

Referring to the drawings and especially to Figure 1, the electro-plating apparatus or cell, comprises a container 1, an anode 2, disposed in the electrolyte or plating bath 3, and a cathode 4 of special construction. The cathode 4 preferably consists of a rotatable member in the form of a disc 5 secured to a shaft 6 which is disposed just above the plating bath 3 for rotation about a fixed axis inclined somewhat from the vertical. A plurality of supports or holders A for the diamonds 10 to be plated are removably mounted on the disc 5 at the peripheral portion thereof and depend from said disc so that in each rotation of the latter each of the diamonds and its holder will be immersed in and moved through the plating bath in a path which closely approaches the anode 2 and will then be removed from the bath. During that portion of each rotation of disc 5 in which each diamond being plated is out of the bath, the plating on the diamond is freed from air bubbles and accordingly such plating is prevented from becoming porous. The anode 2 is preferably disposed in the plating bath 3 adjacent one end of the tank 1 and preferably comprises a mass of nickel shot 11 held in a suitable container 12 of heavy canvass or other porous material. Reference character 13 represents a conductor, preferably of nickel, which extends downwardly in the tank 1 and through and into the container 12 so as to establish contact with the nickel shot 11, this conductor preferably being removed as far as possible from the path of the holders A to thereby prevent the same from being quickly consumed in the operation of the cell. In order further to protect the conductor 13 against electrolytic action, that portion thereof extending from a point just below the top of container 12 and for a considerable distance above the electrolyte 3, is encased in a sheath 14 of rubber or other suitable non-insulating material. Current is supplied to the electro-plating apparatus or cell by means of conductors 15 and 16 extending from a suitable source (not shown), and respectively connected to the contact member 13 and the shaft 6 supporting the rotatable cathode. In the operation of the cell, shaft 6 and cathode 4 are rotated by suitable means (not shown) at a very slow rate, preferably about once every minute.

Each of the holders A consists of a supporting member 18 formed of conducting material, a rod 19 secured to said member at one end and depending therefrom, said rod having a lower end portion 20 extending laterally and then upwardly and being provided at its end with a recess or seat 21, and a small rod or wire 21′ mounted on the member 18 for movement towards and from the recess 21. The rod 19 is preferably formed of non-conductive material such as glass, while the small rod or wire 21′ is formed of conductive material, preferably steel. Rod 21′ is adjustably mounted for reciprocatory or sliding movement in a vertical V-shaped groove 22 formed on the front end or face of the member 18 and is yieldingly held in adjusted position as by means of a spring 23 secured to one end of the member 18 and taking over said rod, the spring being shaped adjacent its free end to conform to the rod 21 as indicated at 24. The lower end portion of the rod 21′ is reduced as indicated at 25, and is adapted to be engaged with a diamond 10 when the latter is seated in the recess 21 at the end of rod 19, to thereby secure the diamond in the holder. Each of the supports 18 is provided with a rearward extension 26 cut away on its under side to form a shoulder 27, while the rotatable member or disc 5 is provided on its upper side with a plurality of radially disposed recesses 28 respectively receiving the portions 26 of the supports 18. The inward movement of the holders A with respect to the disc 5 is limited by the engagement of the shoulders 27 on the members 18 with the edge of the disc. The upper face of the portion 26 of each member 18 is bevelled as indicated at 29, a shoulder 30 being formed between the latter and the upper face of the support. Disposed in each of the recesses 28 and secured at one end to the disc 5 as by means of a screw 31, is a leaf spring 32 provided adjacent its free end with an abrupt downwardly deflected portion 33. With the construction described, each of the holders A may be quickly applied to the disc 5 by engaging the portion 26 thereof in one of the recesses 28 and then pushing the holder inwardly until the shoulder 27 abuts the edge of the disc. In so applying the holder the bevelled face 29 engages beneath the free end of spring 32 and presses the latter upwardly as the holder is moved inwardly, and upon the holder reaching the limit of its inward movement, the deflected portion 33 of spring 32

snaps over the shoulder 30 of the holder, as will be apparent from Fig. 3. The spring 32 then coacts with the shoulder 30 and serves to yieldingly and firmly connect the holder to the disc 5. Any of the holders A may also be readily and quickly removed from the disc or rotatable member 5 merely by exerting an outward pull thereon.

In using the electro-plating apparatus or cell above described to produce mountings for diamonds or the like, of the character described above, a plurality of the diamonds 10, after having the thin coatings of conductive material, such as the silver mirrors, and of metal such as nickel, applied thereto as hereinbefore described, are mounted in the supports or holders A as shown. The holders and the diamonds therein are then preferably cleaned to remove all dirt and oxids therefrom by immersing the same for a short time as cathodes in an electrolytic cleaning cell, removing them from the cell and then washing the same with distilled water. The conductive rod or wire 21′ of each holder A, with the exception of the reduced lower end portion 25 thereof, is then coated with paraffin or other suitable insulating material, after which the holders are mounted on the rotatable disc 5 as shown. The disc 5 is then rotated and current is impressed on the electro-plating cell as above described until each of the diamonds is plated with a mass of nickel or other metal of sufficient thickness to provide a holder therefore. This plating operation is preferably carried on for a period of about 72 hours, a current of about .05 of an ampere being impressed on the plating apparatus or cell at the start and this current being increased at intervals, during the plating operation, up to about .5 or .6 of an ampere. Accordingly the holder thus electro-deposited on each diamond will consist of layers of metal which decrease in density from the innermost layer outwardly. This holder of electro-deposited nickel or other metal, represented by reference character 40 (Fig. 2), is somewhat irregular in shape and because of the coating of paraffin on rod 21′ extends up on the latter only to the top of its reduced end portion 25. Both the reduced end portions 25 of rods 21′ and the points or splints 10 of diamond or the like will be embedded in the holders 40. Obviously one end of each of the diamonds will be closely adjacent one end of the holder in which it is embedded. The rods 21′ together with the holders 40 and the diamonds 10 embedded therein are now removed from holders A, each holder 40 then being separated from the corresponding rod 21′ by severing the latter closely adjacent the top of the holder. It may be noted that the portion 25 of rod 21′ embedded in the holder for the diamond is so small that as a practical matter it is negligible. The holders 40 are then each turned down to proper size as indicated at 40′ in Fig. 4, and material is removed or cut away from one end portion thereof so as to provide the same with a tapered portion from which a portion of the diamond 10 projects. Where the mountings to be produced are for phonograph styli, the tapered end portion of each holder and the projecting portion of the stylus 10 are then ground down to form a conical end portion having a continuous tapered surface 42 formed partly on the holder and partly on the stylus, after which the end of the stylus is rounded as indicated at 10′ so as properly to fit the record grooves with which the stylus is designed to be used.

While I have described the preferred form of apparatus for use in producing a mounting such as described, it is to be understood that the same is subject to many changes and modifications without departure from the spirit of the invention and the scope of the appended claims. It is also to be understood that the said apparatus is capable of being used for producing other types of mountings and for various other plating operations than those described herein.

Having now described my invention, what I claim as new and desire to protect by Letters Patent, is as follows:

1. In an electro-plating cell, a cathode comprising a disc mounted above the plating bath for rotary movement about an inclined axis and a holder for a member to be plated carried by said disc so that in each rotation of the latter said member is adapted to be immersed in and withdrawn from said bath, substantially as described.

2. In an electro-plating cell, a cathode comprising a disc mounted above the plating bath for rotary movement about an inclined axis and a plurality of holders for members to be plated mounted on said disc so that in each rotation of the disc the member to be plated carried by each of said holders is adapted to be immersed in and withdrawn from said bath, substantially as described.

3. In an electro-plating cell, a cathode comprising a member mounted for rotary movement about a fixed axis, said member being provided with a recess, a holder for a member to be plated provided with a portion adapted to engage said recess, and means for yieldingly connecting said holder to said member with said portion disposed in said recess, substantially as described.

4. In an electro-plating cell, a bath, a cathode comprising a device mounted on an inclined axis above said bath for rotary movement and a holder for an article to be plated applied to said device, said device being so arranged relatively to said bath that in each rotation thereof the article to be plated carried by said holder is adapted to be immersed in and withdrawn from said bath, substantially as described.

5. In an electro-plating cell, a bath, a cathode comprising a disc mounted above said bath for rotary movement about an inclined axis and a plurality of holders for articles to be plated removably applied to the edge portion of said disc, said disc being so arranged relatively to said bath that in each rotation of the disc the article to be plated carried by each of said holders is adapted to be immersed in and withdrawn from said bath, substantially as described.

This specification signed this 13th day of August, 1926.

THOS. A. EDISON.