Oct. 15, 1929. W. F. GRUPE 1,731,415

PRODUCTION OF ELECTROLYTICALLY DEPOSITED GOLD IN FILM OR LEAF FORM

Filed Feb. 23, 1927 2 Sheets-Sheet 1

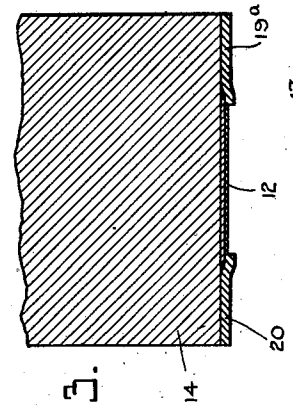


Fig. 3.

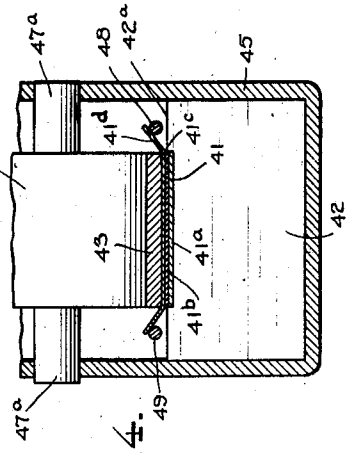


Fig. 4.

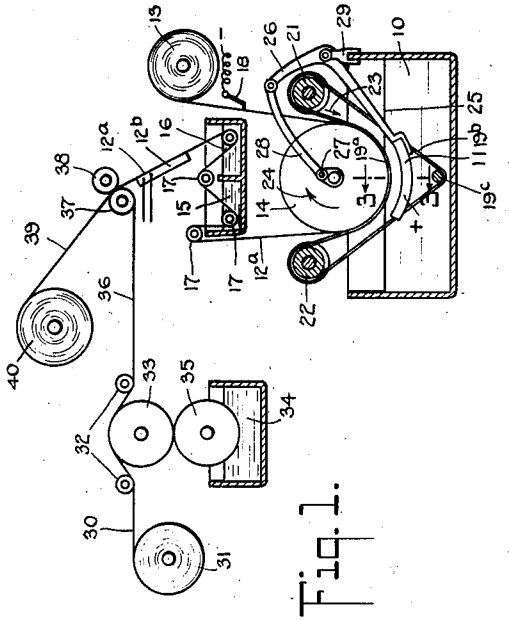


Fig. 1.

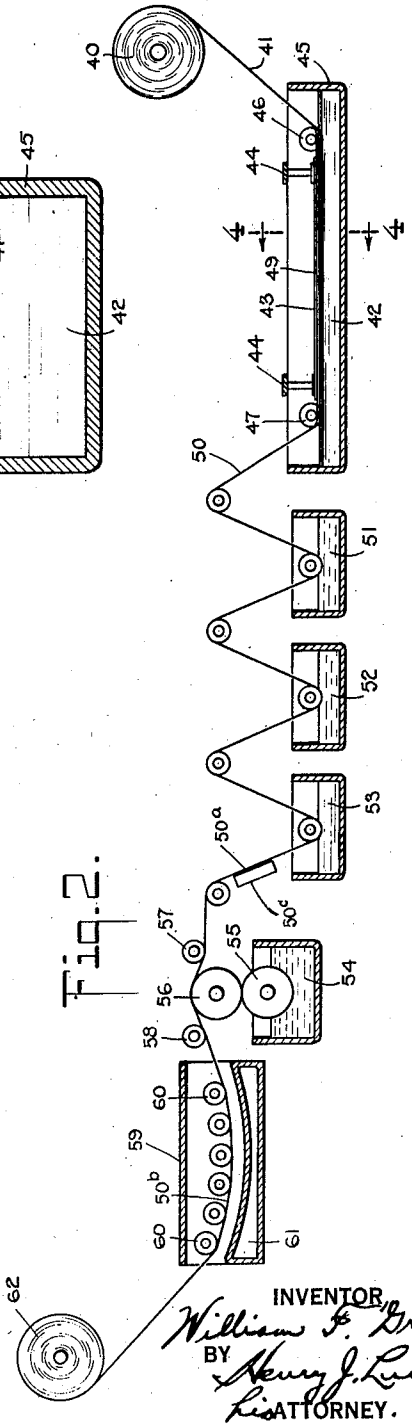


Fig. 2.

INVENTOR,
William F. Grupe,
BY
Henry J. Lucke,
His ATTORNEY.

Oct. 15, 1929. W. F. GRUPE 1,731,415

PRODUCTION OF ELECTROLYTICALLY DEPOSITED GOLD IN FILM OR LEAF FORM

Filed Feb. 23, 1927 2 Sheets-Sheet 2

Fig. 5.

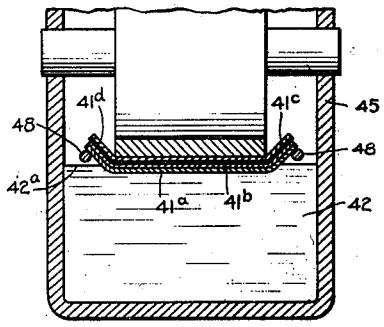


Fig. 6.

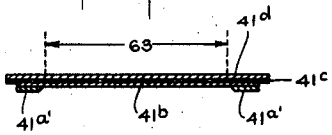


Fig. 7.

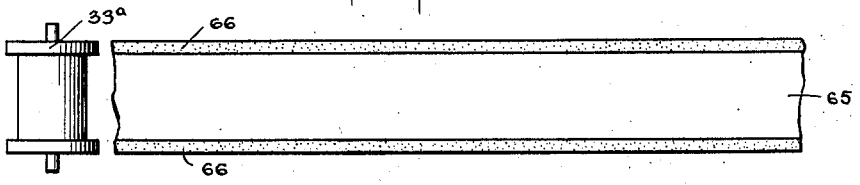


Fig. 8.

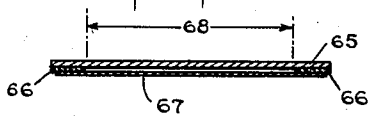


Fig. 9.

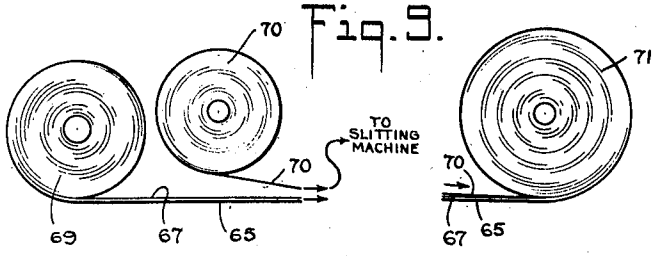
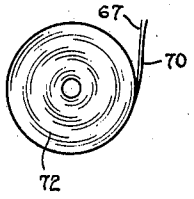


Fig. 10.



INVENTOR,
William F. Grupe,
BY
Henry J. Lucke,
ATTORNEY.

Patented Oct. 15, 1929 1,731,415

UNITED STATES PATENT OFFICE

WILLIAM F. GRUPE, OF RUTHERFORD, NEW JERSEY

PRODUCTION OF ELECTROLYTICALLY-DEPOSITED GOLD IN FILM OR LEAF FORM

Application filed February 23, 1927. Serial No. 170,152.

This invention relates to the production of electrolytically deposited gold in film or leaf form and mounted on an inert carrier such as paper.

Pursuant to my invention, a film or layer of gold is electrolytically deposited on a suitable cathode band of metal of high electrical conductivity, and such deposit of gold is mounted on the inert carrier by suitable procedure.

Preferably, silver is employed as the cathode band.

One method of mounting is by the use of grease-proof paper such as glassine paper, cellophane or other inert carrier, on which beeswax or rosin or other resin, or a mixture of the same, has been applied.

Another method of mounting is by the use of a sheet of non-greaseproof paper, such as tissue paper, with which the gold film is wound, by the intermediate use of an inert carrier.

To attain my final product, in the various forms of my invention, the inert carrier with the gold and the cathode band are treated in a suitable bath of nitric acid or equivalent for dissolving or otherwise removing the silver, whereby the gold film is derived as a continuous sheet of indefinite length, protected by paper or other inert material of corresponding length.

My invention is adapted for immediate use on the present market in the form of a heat releasable transfer medium embodying a continuous layer of electrolytically deposited gold, adhered to the inhert carrier, such as glassine paper, and suitable for use with a heated die in stamping or other impression machines.

Further features and objects of the invention will be more fully understood from the following detailed description and the accompanying drawings, in which

Fig. 1 is a diagram illustrating the respective steps of electrolytic deposition of gold on a metallic cathode band, and applying to the deposited goldface of the cathode band a strip of greaseproof paper or other inert carrier material with the use of a waxy intermediate coating suitable for a heat releasable stamping medium;

Fig. 2 is a diagram illustrating the treatment of the combined cathode band, electrolytic gold deposit and inert carrier, for the removal of the cathode band and deriving an endless length of electrolytically deposited gold applied by the intermediate heat releasable medium to an endless carrier;

Fig. 3 is a sectional elevation on line 3—3 of Fig. 1, on a greatly enlarged scale;

Fig. 4 is a sectional elevation on line 4—4 of Fig. 2, on a greatly enlarged scale;

Fig. 5 is a sectional elevation similar to Fig. 4, but showing a modification of my invention in the removal of the cathode band;

Fig. 6 is a cross-sectional view through a composite strip derived from the procedure indicated in Fig. 5, and indicating the gauge of slitting to attain the desired final product;

Fig. 7 is a top plan view of a portion of a length of paper, to which a water and acid proof adhesive is applied at its opposite ends, illustrating an intermediate step of deriving an indefinite length of gold freely mounted on an inert carrier;

Fig. 8 is a cross-sectional view of a composite strip obtained by the use of the step shown in Fig. 7, and indicating the gauge of slitting to derive a product pursuant to my invention;

Fig. 9 illustrates a modified step of employing tissue paper in conjunction with the derived product indicated in Fig. 8; and

Fig. 10 illustrates a roll of indefinite length of tissue paper and an intermediately wound indefinite length of freely mounted gold film.

Referring to the diagram of Fig. 1, 10 represents an electrolytic bath of gold in any suitable form, such as a solution of the double cyanide of gold and potassium. The anode is indicated at 11, and is preferably an insoluble anode such as platinum. The cathode may be in the form of an endless band 12, preferably of silver, of a thickness of the magnitude of .001 of an inch, and preferably less, and of any desired width, say four inches. Such cathode band 12 is passed continuously

through the bath 10 and subjected to suitable electrolytic action to deposit on one face of the cathode 12 the desired thickness of layer or film of gold. Such endless band 12 may be supplied in the form of a roll 13 and passed over a rotarily mounted drum 14. The derived gold-silver band, designated 12^a, see Fig. 1, is suitably treated to remove any plating solution. Usually I employ a bath 15 of alkali to effectively free the band 12^a of the plating solution, and thereafter a bath 16 of water to remove any alkali carried by the band 12^a after submersion in the bath 15. The band 12^a is then preferably heated, say, by the electrical heater 12^b, to dry the band.

Any desired number of rollers 17, or equivalent, are employed for passing the band 12^a to and through the baths 15, 16.

The electrical negative connection of a suitable source of electrical energy with the silver band 12 during the electrolytic deposition stage, is employed, such as by means of the spring contact 18.

The drum 14, about which the cathode silver band 12 passes through the plating bath, may be of hard rubber, wood or the like, which is inert and resistant to the gold plating solution 10.

I prefer to use suitable means for preventing the deposit of gold at the opposite lateral edges of the silver band 12. One such deposit-preventing means is indicated generally in Fig. 1 and in further detail in Fig. 3, and comprises a belt 19 passed for the length of its one lead 19^a about the periphery of the drum 14 on one side of the cathode band 12 and its other lead 19^b passed over a roller 19^c. A similar band 20 protects the opposite lateral edge of the cathode band 12. Such bands 19, 20 are preferably of "live" rubber, and are guided and retained in position by means of the oppositely disposed rollers 21, 22, one or both of which may be positively driven, say, in the direction of the arrow 23, see Fig. 1, and thereby rotate the drum 14 in the corresponding direction indicated by the arrow 24. Positive means may be employed to drive the cathode drum 14 in the direction of the arrow 24, if desired.

Suitable means are provided for attaining a substantially uniform thickness of deposit, including the circulation of the plating solution from a suitable reservoir (not shown) to the tank 10, and imparting a gentle motion to the anode 11, as by pivotally suspending the anode by means of the arm 25, the upper end 26 of which arm 25 is oscillated by the cam 27, carried by the drum 14, and operating the link 28. The arm 25 is shown pivoted to the bracket 29, secured to one side of the tank 10.

Fig. 1 shows, in addition, the applying of the solution-free and dried gold-silver band to an indefinite length 30 of paper or like inert material, such as glassine paper, cellophane, and the like, which may be supplied in the form of a roll 31, thence passed about idlers 32 over the feeding roll 33 for coating the under face of the glassine strip 30 with a suitable binding material.

As indicated above, a preferred use of my new product is as a heat releasable transfer medium for stamping and other impression machines for ornamentating objects with embossed, intaglio or other ornamentations with gold or like material. For such purpose, a bath 34 of the heat releasable material 34 is employed in fluid form, as by heating the same. For such purpose I may use a mixture of beeswax, rosin or other resin, or cumar, or any suitable phenol condensation products such as phenol condensation products, furfurol products, or the like. The heat-releasable material in such fluid form may be fed from the bath 34 by the roll 35 or equivalent to one side of the paper strip carrier 30.

The strip of paper now coated on its one face with the cooled layer of the binder is forced, see 36, between a pair of pressure rolls 37, 38 against the gold deposited face of the silver band 12^a to form a resulting composite silver-gold-binder-carrier band 39 of indefinite length, which may be wound up as a roll 40.

Such composite strip of paper-binding medium-gold-silver is now suitably treated to remove the silver band or layer. One procedure of removing the silver is by uncoiling the roll 40, see Fig. 2, and passing its length 41 through a bath 42 containing nitric acid or the like for dissolving the silver layer, while retaining the gold film, binding medium and inert carrier immune to nitric acid or other silver-removing medium, and preferably in a manner whereby the nitric acid or other removing medium is prevented from contacting with the layers of the composite band other than the silver.

In Fig. 4 I have illustrated on an enlarged scale a form of a portion of the apparatus shown in Fig. 2, whereby the composite band 41 is progressed through the bath 42 substantially at the level 42^a of the bath 42. It will be noted that the silver layer 41^a is lowermost and brought into direct contact with the nitric acid 42 or equivalent. The gold film 41^b is next adjacent to the silver layer 41^a. To attain proper progression of the composite band 41 through the bath 42, I provide a guide 43 in the form of a horizontally extending plate or set of plates supported at opposite ends by the brackets, 44, 44, suspended from the opposite, upper edges of the tank 45, and preferably combined with the anterior and posterior rollers 46, 47, each respectively mounted in suitable bearings, see 47^a, Fig. 4, in the tank 45.

It is advantageous to provide the paper carrier 41^d of a greater width than the silver layer 41^a, and thereby project at the opposite

lateral edges of the gold-silver layers, to cooperate with the oppositely disposed rods 48, 49, located above the level 42^a of the bath 42 in the tank 45, and thus hold the opposite lateral edges of the paper 41^d positively above the bath 42, and hence prevent the upper surface of the paper 41^d from being wet. By such procedure, paper stock other than glassine paper, may be successfully employed, by reason of the under surface being coated with a water repellant layer such as the layer 41^c of beeswax, rosin or other resins or equivalent, as set forth in detail hereinabove.

After passage of the composite strip 41 through the nitric acid or equivalent bath 42, the band now indicated 50, and deprived of its previous silver layer 41^a, is passed into a bath 51 of alkali or equivalent, to remove any excess nitric acid, thence passed through other baths 52, 53 of the number desired for removing alkali or other moisture from the band 50, which at the stage designated 50^a is then dried. The band at the stage 50 is now formed of an outermost (in this position in Fig. 2 the lowermost) layer of gold film, next a layer of the heat releasable material or other waxy and water repellant binding medium, and lastly, the paper carrier. A heater 50^c may be employed to dry the composite band 50.

When forming a transfer strip having the usual outermost sizing layer, the resultant strip 50^a, see Fig. 2, is further treated in a continuous manner subsequent to the de-silvering stage by providing a bath 54 or equivalent or shellac or other sizing, and applying the desired thickness of layer of sizing to the gold layer of the heat-releasable transfer strip in any suitable manner, as by means of the supplying roll 55 coacting with the applying roll 56, associated with the oppositely disposed guide rollers 57, 58, and then drying the sizing, as by means of an oven 59, preferably embodying a set of rollers 60 disposed to progress the strip 50^b about a curved path to face the steam jacket 61 or equivalent of the oven 59. The dried, sized heat-releasable transfer strip may then be wound up as a roll 62.

If desired, the shellac or other sizing may be sprayed on the gold layer of the heat-releasable transfer strip.

In the de-silvering treatment, the composite silver-gold-binder-paper band may be passed, see Fig. 5, through the nitric acid bath 42, substantially at the level 42^a of the bath, to bend up a portion of the opposite lateral edges of the silver 41^a and gold 41^b as well as the binder 41^c and the paper 41^d, by means of the guide rods 48, whereby the derived band, see Fig. 6, has retained residual lateral strips $41^{a'}$ of the original silver band 41^a. Such residual strips $41^{d'}$ are removed by a suitable slitting machine, or equivalent, and to also provide straight edges on the gold film or layer.

The gauge of slitting is indicated in Fig. 6 by the double arrowed line 63.

By employing electrolytically deposited film, the derived gold possesses a lustre and tone which are superior to the lustre and tone of ordinary gold leaf, i. e., beaten gold. Furthermore, the translucency as well as the lustre and tone of electrolytically deposited gold are substantially uniform throughout the length of the gold strip, whereas these properties of beaten gold leaf are non-uniform, when compared leaf with leaf and the respective portions of any individual leaf.

In Fig. 7, I have illustrated a step of a modified form of my invention. The strip 65 is of suitable material such as glassine paper, cellophane or the like, which may be supplied in the form of a roll similar to the roll 31, in Fig. 1. In this modified form of my invention, however, the adhesive, such as shellac, is applied by an applying roll 33^a, cooperating similar to the applying roll 33 of the adhesive applying device shown in Fig. 1, to locate the shellac at narrow spaces 66, 66 at the opposite lateral edges of the strip 65, whereby such shellac strip 65 is brought into contact with the gold deposited face of the silver band, similar to the procedure in Fig. 1, the use of such modified form of adhesive applying roll 33^a requiring the guide roll 32 to be displaced from the roll 33^a a distance corresponding to the height of lateral annular faces of the roll 33^a. Thereafter, the silver band or layer is removed by means of nitric acid in a bath similar to the bath 42, see Fig. 2, and subsequently treated as above described; in this instance the composite strip, see Fig. 8, is formed of the paper 65 secured by the spaced shellac 66, 66, to the gold film 67. Such resultant composite strip may now be slitted for the desired gauge of slitting indicated by the double arrowed line 68 to remove the shellacked outer edge portions of the paper and the adhered outer edge portions of the gold. The resulting roll 69, see Fig. 9, is formed of convolutions of the carrier strip such as glassine paper, cellophane or the like, having the continuous film of gold 67 wound freely between such convolutions.

A roll of tissue paper or the like having a continuous strip of freely mounted electrolytic or other film of gold may be derived by passing the composite glassine paper, shellac and gold, as illustrated in Fig. 8, jointly with a roll 70 of tissue paper in the manner indicated in Fig. 9, namely by feeding the tissue paper 70 to the gold face 67 of such composite strip and into the slitting machine, thereby deriving a composite roll 71 of desired width, each convolution of which is formed of a layer 70 of tissue paper, and an intermediate layer of gold film 67 and the opposite layer 65 of glassine paper or the like. By unrolling

such roll 71 to remove the glassine paper 65 there is obtained the resulting roll 72, see Fig. 10, of the carrier strip 70 of tissue paper and the continuous film 67 of gold wound freely between the convolutions.

While it has been heretofore proposed and has been marketed genuine gold leaf in so-called "roll" form, such roll has been formed by employing goldbeater's so-called "gold leaf", the individual leaves being applied on a face of a length of paper, which may be rolled to a roll form, usually rouge or the like being employed to prevent the exposed faces of the leaves from adhering to the reverse face of the roll paper. By beating gold pursuant to the so-called "goldbeater's method", the maximum dimension attainable is approximately six or seven inches for leaves having a thickness of one one-thousandth of an inch or less, such maximum length being limited by the ductility and other physical characteristics of gold. By reason of my process yielding gold film of indefinite length as may be desired for the purposes required, I have employed the expression "of a length materially greater than that of beaten gold" to designate in the claims a length of integral gold film exceeding the maximum dimension of goldbeater's gold leaf as may be desired.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. A heat releasable transfer strip comprising a strip of inert material serving as a carrier, a layer of heat releasable medium on one face of the same and a substantially continuously integral layer of gold disposed on said layer of heat releasable material, said layer of gold having a length materially greater than that of beaten gold.

2. A heat releasable transfer strip comprising a strip of inert material serving as a carrier, a layer of heat releasable medium on one face of the same and a layer of continuously integral gold deposited on said layer of heat releasable material, said layer of gold being substantially of uniform thickness throughout the length of the strip, said layer of gold having a length materially greater than that of beaten gold.

3. The method of forming a strip of gold supported by a strip of inert material which comprises subjecting a continuous strip of metal as a cathode to an electrolytic bath containing gold to thereby deposit directly upon said cathode strip, a layer of gold, applying the derived composite strip to a continuous strip of the inert material serving as the supporting strip to the gold face of the composite strip, and dissolving the metal strip while said layer of gold is supported by said continuous strip of inert material, thereby continuously deriving a gold layer supported by a continuous strip of inert material.

4. The method of forming a strip of gold supported by a strip of inert material which comprises subjecting a strip of metal as a cathode to an electrolytic bath containing gold to thereby deposit directly upon such strip of metal a layer of gold, applying the derived composite strip to a strip of inert material serving as a supporting strip, such supporting strip of inert material being applied to the layer of gold and the metal strip being outermost, and dissolving the metal strip from the gold layer while the gold layer is supported by the strip of inert material.

5. The method of forming a strip of gold supported by a strip of inert material which comprises subjecting a continuous strip of metal as a cathode to an electrolytic bath containing gold to thereby deposit directly upon such strip of metal a layer of gold, applying the derived composite strip to a continuous strip of inert material serving as a supporting strip, such supporting strip of inert material being applied to the layer of gold and the metal strip being outermost, and dissolving the metal strip from the gold layer while the gold layer is supported by the strip of inert material.

6. The method of forming a strip of gold supported by a strip of inert material which comprises subjecting a strip of metal as a cathode to an electrolytic bath containing gold to thereby deposit directly upon such strip of metal a layer of gold, applying the derived composite strip to a strip of inert material serving as a supporting strip by the use of a heat releasable medium, and dissolving the metal strip while the gold layer is supported by the strip of inert material and at a temperature lower than the heat releasing temperature of the heat releasable medium.

7. The method of forming a strip of gold supported by a strip of inert material which comprises subjecting a strip of metal as a cathode to an electrolytic bath containing gold to thereby deposit directly upon such strip of metal a layer of gold, applying the derived composite strip to a strip of inert material serving as a supporting strip by the use of a heat releasable medium, and dissolving the metal strip while the gold layer is supported by the strip of inert material by the use of a solvent capable of dissolving the metal cathode strip and incapable of dissolving the gold layer and the heat releasable medium.

8. The method of forming a strip of gold supported by a strip of tissue paper which comprises subjecting a strip of metal as a cathode to an electrolytic bath containing gold to thereby deposit directly upon said strip of metal a layer of gold, applying the derived composite strip to a strip of inert material serving as the supporting strip, dissolving the metal cathode strip while the layer of

gold is supported by the supporting strip of inert material, and transferring the layer of gold from said supporting strip of inert material to a strip of tissue paper.

9. An impression transfer medium comprising a strip of inert material of indefinite length serving as a carrier, a substantially continuously integral film of metal having a length materially greater than that of beaten gold, said metallic film being secured to said carrier strip and releasable by impression transfer.

10. The method of forming a layer of metal supported upon a carrier strip which comprises subjecting a cathode strip to an electrolytic bath containing the metal to thereby deposit upon the cathode strip the layer of the metal, applying the derived composite strip to a carrier strip and dissolving the cathode strip without substantial contact of the dissolving medium with the carrier strip.

In testimony whereof I have signed this specification this 21st day of February, 1927.

WILLIAM F. GRUPE.