

A strip of electrical terminals electroplated with contact metal and a method of, and apparatus for, plating such a strip

There is described in United States Patent Specification No. 4,001,093, a strip of stamped and formed, identical, elongate, electrical terminals comprising a continuous carrier strip from which the terminals extend in spaced juxtaposed relationship, each terminal having a front face and a rear face, connected by side edges, a contact zone of the terminal spanning the front face from one side edge to the other side edge, the contact zone and portions of the front face adjacent thereto having thereon plating of electrodeposited contact metal, such plating being of wear resistant thickness over the contact zone and tapering in thickness away from the contact zone.

According to this prior specification the terminals are selectively and non-uniformly plated whilst they are static, by the use of a strip-shaped and contoured anode which projects outwardly of a wall of the electroplating cell in which the plating operation is carried out, the contact zones of the terminals being spaced by a substantial distance from the anode.

The prior patent specification mentioned above is silent as to relative thicknesses of the wear resistant part of, and the other parts of, the plating on the terminals, which plating may be of various different cross-sectional configurations, the plating being in each case of considerable thickness throughout the greater part of its extent.

In view of the high price of contact metals, which are precious metals, for example gold, the invention is intended to provide a strip of electrical terminals which have been selectively plated with contact metal to the minimum thickness that will ensure a long useful life for the plating of wear resistant thickness, the surface of which must remain uncontaminated if the terminal is to make satisfactory electrical contact with a mating conductor, for example, a conductor of a printed circuit board. The invention also concerns a method and an apparatus by means of which this object can be achieved.

The contamination and degradation of plated contact surfaces by the mechanism of corrosion creep is a serious problem in the manufacture of electrical terminals especially where the terminals are, in use, likely to be subjected to high humidity atmospheres containing hydrogen sulphide, as may sometimes be the case.

Corrosion creep occurs when corrosion products that form on an unplated or an inadequately thickly plated area of a selectively plated terminal, creep from such an area onto the precious metal contact surface of the terminal so as permanently to impair its electrical conductivity.

The invention proceeds from the realisation

that both protection of the contact surface of the contact metal plating, and economy of contact metal, can be achieved by carefully selecting the relative thicknesses of the plating and the extent and location of the plating areas of different thickness, and that such selection can only be achieved by equally careful selection of the parameters that obtain in the plating method and apparatus.

According to a first aspect of the invention, a strip of terminals as defined in the first paragraph of this specification is characterised in that contact metal plating of corrosion resistant thickness extends over the adjacent portions for a distance of substantially between 0.254 mm and 0.381 mm from the longitudinal central plane of the contact zone, which plane is transverse of the terminal, the thickness of the plating being substantially between 0.00254 mm and 0.00508 mm, and, beyond an intermediate area of the plating, which is approximately half the width of the plating of wear resistant thickness on either side of the central plane, the plating of which intermediate area tapering in thickness rapidly away from the plating of wear resistant thickness, the thickness of the contact metal plating of corrosion resistant thickness is between one third and one tenth of the thickness of the plating of wear resistant thickness; the side edges of each terminal on either side of the plating on the front face thereof also being covered with plating of at least the corrosion resistant thickness.

The dimensions quoted above are not in practice susceptible to precise measurement, because of the minuteness of the plated areas of the terminals and these dimensions have accordingly been given only in approximation.

Also as explained below, the corrosion resistant thickness plating on the side edges of the terminal need not be the same extent as that on its front face, since the corners of these edges act as barriers to the creep of the corrosion products.

According to a second aspect of the invention a method of electroplating in an electroplating cell, each terminal of a continuous strip of stamped and formed identical, elongate, electrical terminals, the strip of terminals comprising a continuous carrier strip from which the terminals extend in spaced, juxtaposed relationship, each terminal having a front face and a rear face connected by side edges, a contact zone of the terminal spanning the front face from one side edge to the other side edge, in which method an electrolyte is made to flow continuously through a passageway in the cell, a linear anode extending along a wall of the passageway and longitudinally of the strip and in opposed spaced relationship to the contact zones of the terminals being employed

for the electrodeposition of contact metal plating over the contact zone of each terminal portions of the front face of the terminal adjacent to the contact zone, such plating being of wear resistant thickness over the contact zone and tapering in thickness away from the contact zone; is characterised in that the strip of terminals is fed continuously through the passageway in the cell and longitudinally of the anode embedded in a wall of the passageway with only the working face of the anode exposed, the working face having a width which is less than that of each contact zone, the moving strip of terminals being restrained by side walls of the passageway against movement towards and away from the anode to maintain the contact zones of the terminals spaced from the anode by a distance which is as small as is practicable without the anode being contiguous with the contact zones, the flow rate of the electrolyte through the passageway being sufficient to produce turbulence in the electrolyte and the current flow from the anode to the strip of terminals being at the maximum level which will avoid "burning" (as defined below) of the deposited plating.

According to a third aspect of the invention, apparatus for electroplating each terminal of a continuous strip of stamped and formed identical, elongate, electrical terminals, the strip of terminals, comprising a continuous carrier strip from which the terminals extend in spaced, juxtaposed relationship, each terminal having a front face and a rear face connected by side edges a contact zone of the terminal spanning the front face from one side edge to the other side edge, the apparatus comprising an electroplating cell, a passageway in the cell, a linear anode extending along a first wall of the passageway, means for supporting the strip of terminals with the contact zones of the terminals opposite the anode, means for supplying electroplating current to the anode and to the strip of terminals, and means for causing an electrolyte to flow through the passageway; is characterised by means for feeding the strip of terminals through the passageway and longitudinally of the anode, a second wall of the passageway positioned opposite the first wall thereof, the first and second walls being arranged to confine the strip of terminals between them substantially in a predetermined plane, a channel in the first wall receiving the anode so that the working surface of the anode is flush with the first wall, the width of the anode being substantially 0.5 mm and the walls being shaped and dimensioned so that the contact surfaces of the terminals pass in close proximity to the working surface of the anode as the strip of terminals is fed through the passageway.

The above definitions of the second and third aspects of the invention start from the disclosure of United States Patent Specification No. 4,001,093 mentioned above.

Although it is known from United States

Patent Specification No. 3,644,181 to electroplate a moving cathode by the use of a linear anode, the method and apparatus disclosed in that patent specification are intended to produce plating of uniform thickness. The anode is not embedded in a wall of the plating cell in the manner defined above.

United States Patent Specifications Nos. 4,033,833 and 4,042,467 disclose methods of, and apparatus for, producing electroplating of variable thickness upon a static cathode. The disclosure of these prior specifications adds little or nothing in so far as the present invention is concerned, however, to that of United States Patent Specification No. 4,001,093 which is discussed above.

For a better understanding of the invention reference will now be made by way of example with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of a portion of a strip of electrical terminals;

Figure 2 is an enlarged perspective view, shown partly in section, of a contact spring portion of one of the terminals which has been severed from the strip;

Figure 3 is a side view of the contact spring portion shown in Figure 2, upon which thicknesses of plating electrodeposited contact metal thereon, are indicated numerically;

Figure 4 is a graph illustrating the thicknesses of the plating;

Figure 5 is a top plan view of an electroplating cell; and

Figures 6, 7 and 8 are views taken on the lines VI—VI, VII—VII and VIII—VIII of Figure 5, respectively.

As shown in Figure 1, electrical terminals 2 to be plated, as described below, with contact metal, that is to say a wear and corrosion resistant, highly electrically conductive precious metal e.g. hard gold, are connected in spaced juxtaposed, parallel relationship by means of a continuous carrier strip 6 to provide a strip, generally referenced 4, of terminals. Each terminal 2 comprises a straight supporting shank portion 8, and a bowed contact spring portion 10 formed integrally with the carrier strip 6 as best seen in Figures 6 and 7, the portions 8 and 10 being connected by way of a locating portion 7 having a locking tongue 9 for securing the terminal in a housing (not shown), and shoulders 11 for enclosing complementary shoulders in the housing.

As best seen in Figure 2, the contact spring portion 10 of a terminal 2 which has been severed from the carrier strip 6, comprises a first rectilinear portion 12 extending obliquely from the portion 7 and being connected to a second rectilinear portion 16 by way of a bight 14, the second rectilinear portion 16 extending obliquely with respect to the first rectilinear portion 12. From the portion 16, extends a first arcuate portion 20, which is in turn connected to a second arcuate portion 22 the crest of

which is directed oppositely to that of the portion 20. The terminals 2 are intended to be incorporated in a multi-contact electrical connector (not shown) so that the crest of the bight 14 of each terminal 2 engages a conductor e.g. a conductor of a printed circuit board (not shown), when such has been mated with the multi-contact connector. Since the surface 18 of the crest of the bight 14, which surface is on a front face 13 of the terminal 2, thus constitutes a contact zone, the surface 18 must be provided with plating of contact metal, the thickness of which must be such that it can withstand repeated engagement with, and disengagement from, the said conductor without the integrity of the contact surface of the plating being impaired by wear. Such thickness is known as "wear resistant thickness".

If only the surface 18, which is in the form of a very narrow band spanning opposite side edges 30, 32 of the contact portion 10, be plated with contact metal, there is always the possibility that corrosion products will form on surfaces 24 and 26 of the portions 12 and 16, adjacent to the surface 18 (the contact zone) and will creep over the plating on the surface 18 thereby impairing the integrity of such plating so that it will not make effective electrical contact with the conductor. The plating of the surface 18 is, however, protected from the encroachment of corrosion products by plating the surfaces 24 and 26 in the vicinity of the surface 18, and the side edges 28 and 30, and optionally also part of the rear surface 32 of the contact spring portion 12, with contact metal of corrosion resistant thickness.

Each terminal 12 can be electroplated by means of apparatus described below, with contact metal plating of wear resistant thickness on the surface 18, and with contact metal plating of corrosion resistant thickness on the surfaces 24 and 26, on the side edges 28 and 30 and on part of the rear face 32 of the terminal 2. The plating of wear resistant thickness is bounded by an intermediate area in which the thickness of the plating rapidly tapers away from the surface 18, to corrosion resistant thickness on the surfaces 24 and 26. The side edges 28 and 30 are provided with contact metal plating which varies from the wear resistant thickness of the plating on the surface 18, to the corrosion resistant thickness of the plating on the surfaces 24 and 26. The rear side 32 is plated by means of the apparatus with contact metal of corrosion resistant thickness, such plating extending partially along the rear faces of the portions 12 and 16, although this plating is not as extensive as that on the surfaces 24 and 26.

The corrosion resistant plating on the surfaces 24 and 26 should extend outwardly of the intermediate area for a distance of about 2.54 mm (0.10 inches) to about 3.81 mm (0.15 inches) measured from the centre plane A—A

(Figure 4) of the plating on the surface 18 i.e. from its thickest part, the plane A—A being transverse to the longitudinal direction of the terminal. The corrosion resistant plating on the rear side 32 of the contact portion 10 need not extend for such distance along the rear face 32, since any corrosion products that may form on the side 32 must creep around the corners of the edges 28 and 30 in order to reach the plating on the surface 18, these corners acting as barriers to the movement of the corrosion products which shorten the distance that it can travel from its source on an unplated portion of the side 32.

The thickness of the contact metal plating on the front and rear faces of the plated parts of the contact portion 10 are indicated in units of 0.0000254 mm (microinches) in Figure 3 at intervals of 0.502 mm (0.02 inches). Since the exact thickness of plating in the range of 15 to 20 of the units cannot be determined with precision, the thickness of all the corrosion resistant parts of the plating have been indicated in Figure 3 as being within that range, although the thickness of such parts may vary to some extent.

In the graph of Figure 4 which shows the dimensions of the plating on the front and rear surfaces of the contact portion 10, the ordinate is calibrated in units of 0.0000254 mm (microinches) and the abscissa in millimetres, the ordinate indicating the thickness of the plating and the abscissa, its extent in relation to the centre plane A—A which can, in fact, only be determined with some approximation. Curve B indicates the thickness and extent of the plating on the front surface of the contact portion 10 and the curve C the thickness and extent of the plating on the rear face of the contact portion 10. As will be apparent from Figure 4, the plating area of intermediate thickness (see reference B' on curve B) tapers very rapidly towards the plating of corrosion resistant thickness, and is approximately half the width of the plating of wear resistant thickness, on either side of the plane A—A, so that there is a very substantial economy in the use of contact metal. The volume of contact metal used is proportional to the areas contained within the curves B and C, if the plating on the side edges 28 and 30 be ignored.

Broken line envelope D indicates the volume of contact metal that would need to be used in order to plate one side of the terminal, if the plating were to be of uniform wear resistant thickness, this being some four times that required to produce plating of the cross-sectional configuration described above.

A cell 34 for electroplating the strip 4 of terminals to produce the plating described above with reference to Figures 3 and 4 will now be described with reference to Figures 5 to 8.

The plating cell 34 is comprised in a plating line having cleaning an electropolishing cells

(not shown) for preparing the strip 4 for the deposit of the contact metal.

The cell 34 is mounted in a splash tank 36 (Figure 5) in which electrolyte flowing from the cell 36 is collected and recycled to a reservoir (not shown) for recirculation in the cell 34. The strip 4 is fed through ends 38 and 40 of the cell 34 by a feed mechanism (not shown), in the direction of the arrow X.

The cell 34 comprises two blocks 42 and 44 of inert insulating material, which are secured against each other along a parting line 46. A passageway 48 (Figures 6 and 7) extends through the cell 34 between its ends 38 and 40, the cross-section of the passageway 48 being defined by opposed side walls 50 and 58 of the blocks 42, 44. The wall 50 of the block 42 has a recess 52 therein, which receives the contact bights 14 and adjacent portions, of the terminals 2 of the strip 4. The base wall 56 of the recess 52 is provided with a shallow channel 57 which is opposite to the contact surface 18 of the terminals 2 and in which an anode 54 is received so that anode 54 is embedded in the wall 56 with the working surface 55 of the anode 54 flush with the wall 56. The wall 58 of the block 44 has a semi-circular cross-section projection 62 thereon which is opposite to the recess 52 and which projects towards the rear sides 32 of the terminals 2 of the strip 4. The wall 58 is also provided with a groove 60 dimensioned to receive the locking tongues 9 of the terminals of the strip 4.

The anode 54, which extends substantially the full length of the cell 34, is made up of two lengths 64 and 66 (Figure 8) of inert, electrically conductive metal, for example platinum, extending from the ends 38 and 40 of the cell 34 to the centre thereof. The inner end portions 68 of the lengths 64 and 66 are bent laterally and extend into an opening 67 (Figure 7) in the wall 56 of the recess 52 which opening 67 communicates with a cavity 74 in the block 42. The cavity 74 which extends inwardly from the external side wall 76 of block 42, is closed by a plug 72, the inner end portion 73 of which is cut away to provide a flat surface 70 along which the end portions 68 of the anode lengths 64 and 66 extend as shown in Figure 7. Electroplating current is supplied to the ends 68 of the anode lengths 64 and 66 through an electrically conductive screw 80 which extends through an opening 82 in the top wall 84 of the block 42. A shim 78 of electrically conductive metal is provided between the lower end of screw 80 and the ends 68 of the anode lengths 64 and 66 to prevent damage thereto when the screw 80 is tightened.

An electroplating current supply lead 88 is connected to the screw 80 by means of an electrical terminal 90 fitted to the screw 80 between washers 92, the screw 80 being clamped to the terminal 90 and against the shim 78 by lock nuts 86.

Electrolyte is supplied to the passageway 48 through a tube 94 (Figure 5) which is connected to the cell 34 by a nozzle 96 which communicates with the passageway 48. Advantageously, the cell is so arranged that most of the electrolyte flows towards the end 40 of the cell in the opposite direction to that in which the strip 4 of the terminals 2 is moved through the cell 34, although some of the electrolyte escapes from that end of the passageway 48 which communicates with the end 38 of the cell 34.

As will be apparent from Figures 6 and 7, the passageway 48 is shaped to confine the strip 4 as far as possible against lateral movement while the strip 4 is being fed through the cell 34. Some lateral movement of the moving strip 4 is of course inevitable, but the amplitude of such movement can be limited by proper dimensioning of the passageway 48 and by the provision of stops on the opposed side walls 50 and 58 of the passageway 48, which restrict lateral movement of the strip 4 but which do not interfere with the feeding of the strip 4 through the cell 34. The strip 4 is thus maintained substantially in a predetermined plane. Thus, in the embodiment shown, the upper (as seen in Figures 6 and 7) corner 157 of the recess 52 is closely adjacent to the surfaces of the terminals 2 to restrain leftward (as seen in Figures 6 and 7) movement of the terminals 2. If the strip 4 tends to cock or swing, from the plane in which it is shown in Figures 6 and 7, the outer ends of the shank portions 8 of the terminals 2, or the outer end portion of the carrier strip 6, engage one or the other of the walls 50 and 58 so that such swinging or cocking motion of the strip is checked.

One reason for maintaining the strip 4 as nearly as possible in a predetermined plane as it passes through the cell 34 is to maintain the distance between the anode 54 and the surfaces 18 of the terminals 2 as nearly constant as is practical. This distance should be as short as can be achieved in the light of practical considerations in the design of the cell. Ideally therefore the anode 54 should be as near to the surface 18 as possible without actually touching it, best to localise the deposit of the contact metal, but as a practical matter, a distance of about 1.27 mm (0.05 inches) should be maintained between the surface 18 and the anode 54. With a normal spacing of about 1.27 mm (0.05 inches), the actual distance between the surface 18 and the anode 54 will vary slightly by reason of such lateral movement of the strip 4 as is permitted, or by reason of tolerance variations in the strip 4. Such variations result in corresponding variations in the thickness of the deposited contact metal. The operating conditions should therefore be such that the minimum thickness of the plating deposited on the surface 18 is equal to the minimum required wear resistant thickness.

The location, the size, and the manner of

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mounting of the anode 54 are also important. In addition to the anode 54 being positioned as close as is practical to the surface 18 the width or diameter of the anode should be as small as possible. There is, however, as a practical matter, a lower limit for the size of the anode 54, this limit being dictated by considerations of the assembly of the anode 54 to the cell 34, the durability of the anode 54, and the manufacture of the anode 54. An anode having a transverse dimension of about 0.508 mm (0.02 inches) is substantially the narrowest that can be achieved for use in a practical commercial plating cell capable of continuous commercial use, as opposed to use under laboratory conditions. The anode 54 is, as shown in Figure 6, of square cross-section. Such an anode may be produced by slitting platinum strip or other precious metal strip. Alternatively, the anode may be produced by drawing, the minimum diameter for commercial use of such a drawn wire anode, also being about 0.508 mm (0.02 inches).

An important feature of the plating cell is that the anode 54 is embedded in the wall 56 as shown in Figure 6 so that only the working surface 55 of the anode 54 is exposed to the surface 18 of the terminals 2. Such embedding of the anode 54 has the effect of concentrating the electrical field produced by the anode 54 on the surfaces 18 of the terminals 2 thereby causing contact metal to be deposited on the surfaces 18 as the strip 4 is being passed through the cell 34. The terminal surface areas which surround the surface 18 are subjected to a greatly reduced electrical field so that there is a rapid decrease in the rate at which the contact metal is deposited, as the distance of such surface areas from the surface 18 increases. The rate of deposit of the contact metal is also affected by the distance between any point of the surface of a terminal 2 and the anode 54, since a plating cell approximates to a linear resistor. It follows, therefore, that the resistances in the cell between the surface 18 of the terminals 2 and the anode 54 are at a minimum level, whilst the resistance between more remote surface portions of the terminals and the anode 54 exceeds the minimum resistance.

As mentioned above, a corrosion resistant zone extending up to about 2.54 mm (0.10 inches) to about 3.18 mm (0.15 inches) along the surfaces 24 and 26, as measured from the centre plane A—A of the plating on the contact surface of the terminal 2 is sufficient to prevent the encroachment of corrosion products onto such plating, the sharp corners which separate the front face 13 of the terminal 2 from its rear face 32 serving as barriers to the movement of corrosion products, thus shortening the required linear extent from the centre plane A—A of the plating of wear resistant thickness, of the plating of corrosion resistant thickness. The requirement for corrosion resistant plating

extending for about 2.54 mm (0.10 inches) to 3.18 mm (0.15 inches) from the centre plane A—A of the plating of wear resistant thickness was determined by study of the corrosion creep phenomenon, it having been found that corrosion resistant plating of this width is sufficient to withstand the environmental conditions encountered in the normal use of an electrical connector. It has been demonstrated that corrosion products will in fact travel distances greatly in excess of 3.18 mm (0.15 inches) under accelerated testing conditions, for example, abnormally high humidity, and ideal temperature conditions for the formation and creep of corrosion products. Such conditions, however, are not encountered in the actual use of electrical connectors. The requirement for the corrosion resistant plating to extend for about 2.54 mm (0.10 inches) to 3.18 mm (0.15 inches) from the centre plane A—A of the wear resistant plating does not vary appreciably with the size of the terminal but applies to terminals of all types and sizes.

The thickness of the plating of wear resistant thickness should be in the range of about 0.00254 mm (100 microinches) to about 0.00508 mm (200 microinches) and that of the plating of corrosion resistant thickness about 0.000381 mm (15 microinches) to about 0.000762 mm (30 microinches). Hard gold plating having a minimum thickness of about 0.00254 mm (100 microinches) is generally the required on electrical contacts, to provide adequate wear resistance, plating having a thickness of about 0.00381 mm (150 microinches) being more commonly employed. Only under abnormal circumstances would hard gold, wear resistant, plating need to have a thickness in excess of 0.00508 mm (200 microinches) since plating of that thickness is sufficient to satisfy virtually all of the requirements which are encountered in the commercial use of electrical connectors of most kinds.

Reference has been made above, to the importance of the geometry of the plating cell, the shape of the anode and the manner in which the anode is mounted in the cell, the location of the cathode, i.e. the strip 4, with reference to the anode, and the control of the lateral movement of the cathode in the cell. The peak current density will vary from the treatment of one type of terminal to that of another. It may be said, however, that in general, the peak current density should be in the range of about 200 to 1,000 amperes per 929 cm² (square foot) over the surfaces 18 of the terminals as they pass through the cell. The current densities in the areas where the plating of corrosion resistant thickness is being applied, will, as will be appreciated from the discussion above, be significantly less than the peak current density. Although it would be impractical to measure the current densities in the cell in view of the speed of movement of the strip 4 and of the electrolyte

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and the variations in current density between surfaces 18 and those to which the plating of corrosion resistant thickness is to be applied, the current density values can be calculated by measuring the amount of plating deposited, calculating the rate of deposit thereof, and determining the current densities from the rate of deposit. Calculations have indicated that current densities of about 800 amperes per 929 cm² (square foot) are achieved at the surfaces 18, the current densities being about one tenth of that Figure at the surfaces which are being plated to corrosion resistant thickness.

Such high current densities require a relatively high flow rate in the electrolyte in order to avoid polarisation with a resulting loss of plating efficiency. The flow rate of the electrolyte may be about 3.048 metres (10 feet) per second when the electrolyte is moving in the direction opposite to that in which the strip 4 is passed through the cell 34. Typical strip feeding rates are of the order of 1.2192 metres (4 feet) to 4.572 metres (15 feet) per minute depending upon the length of the plating cell. A flow rate of about 3.048 metres (10 feet) per second for the electrolyte will ensure the achievement of turbulent flow in the vicinity of the strip 4 rather than lammelar flow and will therefore avoid polarisation.

Although other precious metals may be employed as contact metal, in practice gold is the most commonly used metal for plating electrical terminals. Palladium is also used. Where the contact metal is hard gold, the electrolyte may be of the following composition:—

120 grammes per litre potassium citrate,
24 grammes per litres potassium gold cyanide,

2.5 grammes per litre cobalt sulphate hipto hydrate pH—4,

the bath temperature being 65.56°C (150°F).

Good results have been obtained by plating terminals 2 in a cell 34 having a length of 30.48 cm (1 foot), the strip 4 being passed through the cell 34 at a speed of 1.2192 metres (4 feet) per minute. A current of three amperes yielded the required current density to produce a plating according to the invention.

The speed at which the strip 4 is passed through the cell should be such that each terminal remains in the cell for about fifteen seconds. Thus where the length of the cell is 30.48 cm (1 foot) the speed of the strip 4 should be in the range of 1.2192 metres (4 feet) to 1.8288 metres (6 feet) per minute. Where the cell is longer, the strip 4 may, of course, be fed through it at a higher speed.

The current of three amperes per linear 30.48 cm (1 foot) of plating cell is substantially the maximum current which can be maintained under the operating conditions described above without "burning" the deposited plating with the result that the finished plating is brownish in

appearance and has a spongy structure which is totally unsatisfactory. Such "burning" of the plating is probably the result of uncontrolled nucleation of the deposited gold which causes the spongy structure of the deposit and its brown appearance. A satisfactory gold plating, which is obtained when the above amperage limitation is observed, has by contrast an orderly grain structure and the deposit is firmly adherent to the substrate. The voltage impressed on the plating line should be about six volts but will vary with several factors, such as the voltage drop associated with the means (not shown) for electrically contacting the moving strip 4.

The plating cell should be specifically designed for the terminal strip to be plated, particular attention being paid to the cross-section of shape of the passageway in the cell, to achieve the desired location of the terminal strip relative to the anode, as well as to the turbulent flow of the electrolyte and the maintenance of the terminal strip in its own plane with a minimum of lateral movement so as to minimize variation in the desired plating thicknesses. Many terminals which are provided with localised contact surfaces have a convex contact surface similar to the surface 18 and this surface should be located in close proximity to the anode. The terminals may, however, be rectilinear being for example in the form of terminal posts, the cell being designed appropriately to the configuration and dimensions of these terminals.

Claims

1. A strip (4) of stamped and formed, identical, elongate, electrical terminals (2) comprising a continuous carrier strip (6) from which the terminals (2) extend in spaced juxtaposed relationship, each terminal (2) having a front face (13) and a rear face (32) connected by side edges (28, 30), a contact zone (18) of the terminal (2) spanning the front face (13) from one side edge (28, 30) to the other side edge (28, 30), the contact zone (18) and portions (24 and 26) of the front face (13) adjacent thereto having thereon plating of electrodeposited contact metal, such plating being of wear resistant thickness over the contact zone (18) and tapering in thickness away from the contact zone (18); characterised in that contact metal plating of corrosion resistant thickness extends over the adjacent portions (24 and 26) for a distance of substantially between 0.254 mm and 0.381 mm from the longitudinal central plane (A—A) of the contact zone (18), which plane is transverse of the terminal, the thickness of the plating being substantially between 0.00254 mm and 0.00508 mm, and, beyond an intermediate area (B') of the plating, which is approximately half the width of the plating of wear resistant thickness on either side of the

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and the variations in current density between surfaces 18 and those to which the plating of corrosion resistant thickness is to be applied, the current density values can be calculated by measuring the amount of plating deposited, calculating the rate of deposit thereof, and determining the current densities from the rate of deposit. Calculations have indicated that current densities of about 800 amperes per 929 cm² (square foot) are achieved at the surfaces 18, the current densities being about one tenth of that Figure at the surfaces which are being plated to corrosion resistant thickness.

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Although other precious metals may be employed as contact metal, in practice gold is the most commonly used metal for plating electrical terminals. Palladium is also used. Where the contact metal is hard gold, the electrolyte may be of the following composition:—

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The current of three amperes per linear 30.48 cm (1 foot) of plating cell is substantially the maximum current which can be maintained under the operating conditions described above without "burning" the deposited plating with the result that the finished plating is brownish in

appearance and has a spongy structure which is totally unsatisfactory. Such "burning" of the plating is probably the result of uncontrolled nucleation of the deposited gold which causes the spongy structure of the deposit and its brown appearance. A satisfactory gold plating, which is obtained when the above amperage limitation is observed, has by contrast an orderly grain structure and the deposit is firmly adherent to the substrate. The voltage impressed on the plating line should be about six volts but will vary with several factors, such as the voltage drop associated with the means (not shown) for electrically contacting the moving strip 4.

The plating cell should be specifically designed for the terminal strip to be plated, particular attention being paid to the cross-section of shape of the passageway in the cell, to achieve the desired location of the terminal strip relative to the anode, as well as to the turbulent flow of the electrolyte and the maintenance of the terminal strip in its own plane with a minimum of lateral movement so as to minimize variation in the desired plating thicknesses. Many terminals which are provided with localised contact surfaces have a convex contact surface similar to the surface 18 and this surface should be located in close proximity to the anode. The terminals may, however, be rectilinear being for example in the form of terminal posts, the cell being designed appropriately to the configuration and dimensions of these terminals.

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1. A strip (4) of stamped and formed, identical, elongate, electrical terminals (2) comprising a continuous carrier strip (6) from which the terminals (2) extend in spaced juxtaposed relationship, each terminal (2) having a front face (13) and a rear face (32) connected by side edges (28, 30), a contact zone (18) of the terminal (2) spanning the front face (13) from one side edge (28, 30) to the other side edge (28, 30), the contact zone (18) and portions (24 and 26) of the front face (13) adjacent thereto having thereon plating of electrodeposited contact metal, such plating being of wear resistant thickness over the contact zone (18) and tapering in thickness away from the contact zone (18); characterised in that contact metal plating of corrosion resistant thickness extends over the adjacent portions (24 and 26) for a distance of substantially between 0.254 mm and 0.381 mm from the longitudinal central plane (A—A) of the contact zone (18), which plane is transverse of the terminal, the thickness of the plating being substantially between 0.00254 mm and 0.00508 mm, and, beyond an intermediate area (B') of the plating, which is approximately half the width of the plating of wear resistant thickness on either side of the



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central plane (A—A), the plating of which intermediate area tapering in thickness rapidly away from the plating of wear resistant thickness, the thickness of the contact metal plating of corrosion resistant thickness is between one third and one tenth of the thickness of the plating of wear resistant thickness; the side edges (28, 30) of each terminal (2) on either side of the plating on the front face (13) thereof also being covered with plating of at least the corrosion resistant thickness.

2. A strip of terminals according to Claim 1, characterised in that the rear face (32) of each terminal (2) is covered, over an area which is opposite at least the plating of wear resistant thickness on the front face (13) of the terminal (2), with plating which is at least of the corrosion resistant thickness.

3. A strip of terminals according to Claim 1 or 2, characterised in that the thickness of the plating of corrosion resistant thickness is substantially between 0.000381 mm and 0.000762 mm.

4. A method of electroplating in an electroplating cell (34), each terminal (2) of a continuous strip (4) of stamped and formed identical, elongate, electrical terminals (2), the strip (4) of terminals comprising a continuous carrier strip (6) from which the terminals (2) extend in spaced, juxtaposed relationship, each terminal (2) having a front face (13) and a rear face (32) connected by side edges (28, 30), a contact zone (18) of the terminal (2) spanning the front face from one side edge (28, 30) to the other side edge (28, 30), in which method an electrolyte is made to flow continuously through a passageway (48) in the cell (34), a linear anode (54) extending along a wall (56) of the passageway (48) and longitudinally of the strip (4) and in opposed spaced relationship to the contact zones (18) of the terminals (2) being employed for the electrodeposition of contact metal plating over the contact zone (18) of each terminal (2) and portions (24, 26) of the front face of the terminal (2) adjacent to the contact zone (18), such plating being of wear resistant thickness over the contact zone (18) and tapering in thickness away from the contact zone (18); characterised in that the strip (4) of terminals (2) is fed continuously through the passageway (48) in the cell (34) and longitudinally of the anode (54) which is embedded in a wall (56) of the passageway (48), with only the working face (55) of the anode (54) exposed, the working face having a width which is less than that of each contact zone (18) the moving strip (4) of terminals being restrained by side walls (50, 58) of the passageway (48) against movement towards and away from the anode (54) to maintain the contact zones (18) of the terminals (2) spaced from the anode (54) by a distance which is as small as is practicable without the anode (54) being contiguous with the contact zones (18), the flow rate of the

electrolyte through the passageway (48) being sufficient to produce turbulence in the electrolyte and the current flow from the anode (54) to the strip (4) of terminals (2) being at the maximum level which will avoid "burning" (as herein defined) of the plating.

5. A method according to Claim 4, characterised in that the contact zones (18) of the terminals are spaced from the anode (54) each by a distance substantially 1.27 mm.

6. A method according to Claim 4 or 5, characterised in that the peak current density over the contact surfaces (18) of the terminals (2) is in the range of 200 to 1,000 amperes per 929 cm², the flow rate of the electrolyte being substantially 3 metres per second.

7. A method according to Claim 4, 5 or 6, characterised in that the strip (4) is fed through the passageway (54) at a rate of 1.2 to 4.5 metres per minute.

8. Apparatus for electroplating each terminal (2) of a continuous strip (4) of stamped and formed identical, elongate, electrical terminals (2), the strip of terminals (4) comprising a continuous carrier strip (6) from which the terminals (2) extend in spaced, juxtaposed relationship, each terminal (2) having a front face (13) and a rear face (32) connected by side edges (28, 30) a contact zone (18) of the terminal (2) spanning the front face from one side edge (28, 30) to the other side edge (28, 30), the apparatus comprising an electroplating cell (34), a passageway (48) in the cell (34), a linear anode (54) extending along a first wall (56) of the passageway (48), means (50, 58) for supporting the strip (4) of terminals (2) with the contact zones (18) of the terminals (2) opposite the anode (54), means for supplying electroplating current to the anode (54) and to the strip (4) of terminals (2) and means for causing an electrolyte to flow through the passageway (48); characterised by means for feeding the strip (4) of terminals (2) through the passageway (48) and longitudinally of the anode, a second wall (58) of the passageway (48) positioned opposite the first wall (56) thereof, the first and second walls (56 and 58) being arranged to confine the strip (4) of terminals (2) between them substantially in a predetermined plane, a channel (57) in the first wall (56) receiving the anode (54) so that the working surface (55) of the anode (54) is substantially flush with the first wall (56), the width of the anode being substantially 0.5 mm, and the walls (56 and 58) being shaped and dimensioned so that the contact surfaces (18) of the terminals (2) pass in close proximity to the working surface of the anode (54) as the strip (4) of terminals (2) is fed through the passageway (48).

9. Apparatus according to Claim 8, characterised in that the first wall (56) includes a recess (52) the first wall and recess co-operating with the second wall (58) to define the passageway (48), which second wall (58)



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has a projection (62) positioned opposite the recess (5) a corner (157) of the recess (52) co-operating with the projection (62) to position the strip (4) of terminals (2) with respect to the anode (54).

10. Apparatus according to Claim 8 or 9, characterised in that the anode (54) comprises two anode sections (64 and 66), an end portion (68) of each of which extends into a cavity (74) in the first wall (56), in contiguous relationship with, and in electrical contact with, means (78, 80) for supplying electroplating current to the anode (54).

Revendications

1. Bande (4) de bornes électriques allongées, identiques, embouties et formées (2) comprenant une bande support continue (6) de laquelle les bornes (2) partent à proximité les unes des autres, chaque borne (2) ayant une face avant (13) et une face arrière (32) reliées par des bords latéraux (28, 30), une zone (18) de contact de la borne (2) traversant la face avant (13) d'un bord latéral (28, 30) à l'autre bord latéral (28, 30), la zone de contact (18) et des parties (24 et 26) de la face avant (13), qui lui sont adjacentes, portant un revêtement de métal de contact électrodéposé, ce revêtement étant d'une épaisseur résistante à l'usure sur la zone de contact (18) et diminuant d'épaisseur en s'éloignant de la zone de contact (18); caractérisée en ce qu'un revêtement de métal de contact d'épaisseur résistante à la corrosion s'étend sur les parties adjacentes (24 et 26) sur une distance sensiblement comprise entre 0,254 mm et 0,381 mm à partir du plan central longitudinal (A—A) de la zone de contact (18), lequel plan est transversal à la borne, l'épaisseur du revêtement étant sensiblement comprise entre 0,00254 mm et 0,00508 mm, et, au-delà d'une zone intermédiaire (B') du revêtement, qui est à peu près la moitié de la largeur du revêtement d'épaisseur résistante à l'usure, de part et d'autre du plan central (A—A), zone intermédiaire dont le revêtement diminue rapidement d'épaisseur en s'éloignant du revêtement d'épaisseur résistante à l'usure, l'épaisseur du revêtement de métal de contact d'épaisseur résistante à la corrosion est comprise entre un tiers et un dixième de l'épaisseur du revêtement d'épaisseur résistante à l'usure; les bords latéraux (28, 30) de chaque borne (2), de part et d'autre du revêtement de la face avant (13) de cette borne, étant également recouverts d'un revêtement d'au moins l'épaisseur résistante à la corrosion.

2. Bande de bornes selon la revendication 1, caractérisée en ce que la face arrière (32) de chaque borne (2) est recouverte, sur une zone qui est opposée au moins au revêtement d'épaisseur résistante à l'usure de la face avant (13) de la borne (2), d'un revêtement qui est d'au moins l'épaisseur résistante à la corrosion.

3. Bande de bornes selon la revendication 1 ou 2, caractérisée en ce que l'épaisseur du revêtement d'épaisseur résistante à la corrosion est sensiblement comprise entre 0,000381 mm et 0,000762 mm.

4. Procédé pour revêtir par galvanoplastie, dans une cellule (34) de galvanoplastie, chaque borne (2) d'une bande continue (4) de bornes électriques allongées identiques, embouties et formées (2), la bande (4) de bornes comprenant une bande support continue (6) de laquelle les bornes (2) partent à proximité les unes des autres, chaque borne (2) ayant une face avant (13) et une face arrière (32) reliées par des bords latéraux (28, 30), une zone de contact (18) de la borne (2) s'étendant en travers de la face avant d'un bord latéral (28, 30) à l'autre bord latéral (28, 30), procédé dans lequel un électrolyte est mis en écoulement continu dans un canal (48) situé dans la cellule (34), une anode linéaire (54) s'étendant le long d'une paroi (56) du canal (48) et longitudinalement à la bande (4), et en face et à distance des zones de contact (18) des bornes (2), étant utilisée pour l'électrodéposition d'un revêtement de métal de contact sur la zone de contact (18) de chaque borne (2) et sur des parties (24, 26) de la face avant de la borne (2) adjacentes à la zone de contact (18), ce revêtement étant d'une épaisseur résistante à l'usure sur la zone de contact (18) et diminuant d'épaisseur en s'éloignant de la zone de contact (18); caractérisé en ce que la bande (4) de bornes (2) est avancée en continu dans le canal (48) de la cellule (34) et longitudinalement à l'anode (54) qui est encastrée dans une paroi (56) du canal (48), seule la face de travail (55) de l'anode (54) étant exposée, la face de travail ayant une largeur qui est inférieure à celle de chaque zone (18) de contact, la bande (4) de bornes en mouvement étant maintenue par des parois latérales (50, 58) du canal (48) de manière à ne pas pouvoir se rapprocher et s'éloigner de l'anode (54) pour maintenir les zones (18) de contact des bornes (2) espacées de l'anode (54) d'une distance qui est aussi faible que possible en pratique sans que l'anode (54) soit contiguë aux zones de contact (18), la vitesse d'écoulement de l'électrolyte dans le canal (48) étant suffisante pour produire une turbulence dans l'électrolyte et le courant circulant de l'anode (54) vers la bande (4) de bornes (2) étant au niveau maximal qui ne produit pas de "brûlage" (tel que défini ci-après) du revêtement.

5. Procédé selon la revendication 4, caractérisé en ce que les zones de contact (18) des bornes sont espacées de l'anode (54) chacune d'une distance sensiblement de 1,27 mm.

6. Procédé selon la revendication 4 ou 5, caractérisé en ce que la pointe de la densité de courant sur les surfaces de contact (18) des bornes (2) est dans la plage de 200 à 1000 ampères par 929 cm², la vitesse d'écoulement



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de l'électrolyte étant sensiblement de 3 mètres par seconde.

7. Procédé selon la revendication 4, 5 ou 6, caractérisé en ce que la bande (4) est avancée dans le canal (54) à une vitesse de 1, 2 à 4, 5 mètres par minute.

8. Appareil pour revêtir par galvanoplastie chaque borne (2) d'une bande continue (4) de bornes électriques allongées, identiques, embouties et formées (2), la bande de bornes (4) comprenant une bande support continue (6) de laquelle les bornes (2) partent à distance les unes des autres, chaque borne (2) ayant une face avant (13) et une face arrière (32) reliées par des bords latéraux (28, 30), une zone de contact (18) de la borne (2) traversant la face avant d'un bord latéral (28, 30) à l'autre bord latéral (28, 30), l'appareil comprenant une cellule de galvanoplastie (34), un canal (48) situé dans la cellule (34), une anode linéaire (54) s'étendant le long d'une première paroi (56) du canal (48), des moyens (50, 58) destinés à supporter la bande (4) de bornes (2) de manière que les zones de contact (18) des bornes (2) soient opposées à l'anode (54), des moyens destinés à alimenter en courant galvanoplastique l'anode (54) et la bande (4) de bornes (2) et des moyens destinés à provoquer l'écoulement d'un électrolyte dans le canal (48); caractérisé par des moyens pour faire avancer la bande (4) de bornes (2) dans le canal (48) et longitudinalement à l'anode, une seconde paroi (58) du canal (48), placée en face de la première paroi (56) de celui-ci, les première et seconde parois (56 et 58) étant agencées pour maintenir entre elles la bande (4) de bornes (2), sensiblement dans un plan prédéterminé, une rainure (57) de la première paroi (56) recevant l'anode (54) de manière que la surface de travail (55) de l'anode (54) soit sensiblement à fleur de la première paroi (56), la largeur de l'anode étant sensiblement de 0,5 mm, et les parois (56 et 58) étant configurées et dimensionnées de manière que les surfaces de contact (18) des bornes (2) passent à proximité immédiate de la surface de travail de l'anode (54) lorsque la bande (4) de bornes (2) est avancée dans le canal (48).

9. Appareil selon la revendication 8, caractérisé en ce que la première paroi (56) présente un évidement (52), la première paroi et l'évidement coopérant avec la seconde paroi (58) pour définir le canal (48), laquelle seconde paroi (58) comporte une saillie (62) disposée en face de l'évidement (52), un angle (157) de l'évidement (52) coopérant avec la saillie (62) pour positionner la bande (4) de bornes (2) par rapport à l'anode (54).

10. Appareil selon la revendication 8 ou 9, caractérisé en ce que l'anode (54) comprend deux sections d'anode (64 et 66), dont un tronçon extrême de chacune d'elles pénètre dans une cavité (74) de la première paroi (56), de façon à être contigu à et en contact électrique avec des moyens (78, 80) destinés à

fournir du courant galvanoplastique vers l'anode (54).

Patentansprüche

1. Ein Streifen (4) aus gestanzten und geformten identischen, langgestreckten elektrischen Anschlüssen (2) umfaßt eine kontinuierlichen Trägerstreifen (6), von dem aus sich die Anschlüsse (2) in einer beabstandeten, nebeneinander angeordneten Lage erstrecken, wobei jeder Anschluß (2) eine vordere Fläche (13) und eine hintere Fläche (32) umfaßt, die durch Seitenkanten (28, 30) miteinander verbunden sind, und wobei ein Kontaktbereich (18) des Anschlusses (2) die Vorderfläche (13) von der einen Seitenkante (28, 30) bis zur anderen Seitenkante (28, 30) überspannt und auf dem Kontaktbereich (18) und Teilen (24 und 26) der Vorderfläche (13), die dem Kontaktbereich benachbart sind, eine Beschichtung aus galvanisch abgeschiedenem Kontaktmetall vorhanden ist, die eine abnutzungsresistente Dicke über dem Kontaktbereich (18) aufweist und sich in ihrer Dicke von dem Kontaktbereich (18) weg verjüngt, dadurch gekennzeichnet, daß sich eine Kontaktmetallbeschichtung mit korrosionsresistenter Dicke über die benachbarten Teile (24 und 26) über einen Abstand erstreckt, der gemessen von der Longitudinalen, quer zum Anschluß verlaufenden Mittelebene (A—A) des Kontaktbereichs (18) im wesentlichen zwischen 0,254 mm und 0,381 mm liegt, daß die Dicke der Beschichtung im wesentlichen zwischen 0,00254 mm und 0,00508 mm liegt, daß jenseits eines Zwischenbereichs (B') der Beschichtung, der näherungsweise die halbe Breite der Beschichtung mit abnutzungsresistenter Dicke auf beiden Seiten der Mittelebene (A—A) besitzt und in dem sich die Beschichtung in ihrer Dicke von der Beschichtung mit abnutzungsresistenter Dicke weg rasch verjüngt, die Dicke der Kontaktmetallbeschichtung mit korrosionsresistenter Dicke zwischen einem Drittel und einem Zehntel der Dicke der Beschichtung mit abnutzungsresistenter Dicke beträgt, und daß die Seitenkanten (28, 30) eines jeden Anschlusses (2) auf beiden Seiten der Beschichtung auf der Vorderfläche (13) ebenfalls mit einer Beschichtung bedeckt sind, die zumindest die korrosionsresistente Dicke aufweist.

2. Streifen aus Anschlüssen nach Anspruch 1, dadurch gekennzeichnet, daß die hintere Fläche (32) eines jeden Anschlusses (2) über einen Flächenbereich, der zumindest der Beschichtung mit abnutzungsresistenter Dicke auf der Vorderfläche (13) des Anschlusses (2) gegenüberliegt, mit einer Beschichtung bedeckt ist, die zumindest die korrosionsresistente Dicke aufweist.

3. Streifen aus Anschlüssen nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Dicke der Beschichtung mit korrosionsresistenter Dicke im wesentlichen zwischen



0,000381 mm und 0,000762 mm liegt.

Verfahren zum galvanischen Beschichten in einer galvanischen Abscheidungszone (34) eines jeden Anschlusses (2) eines kontinuierlichen Streifens (4) von gestanzten und geformten identischen, langgestreckten elektrischen Anschlüssen (2), wobei der Streifen (4) aus Anschlüssen einen kontinuierlichen Trägerstreifen (6) umfaßt, von dem aus sich die Anschlüsse (2) in einer beabstandeten, nebeneinander angeordneten Relation erstrecken, wobei jeder Anschluß (2) eine Vorderfläche (13) und eine hintere Fläche (32) aufweist, die durch Seitenkanten (28, 30) miteinander verbunden sind, wobei weiterhin eine Kontaktzone (18) des Anschlusses (2) die vordere Fläche von einer Seitenkante (28, 30) bis zur anderen Seitenkante (28, 30) überspannt, wobei bei dem Verfahren ein Elektrolyt dazu gebracht wird, kontinuierlich durch einen Durchgang (48) in der Zelle (34) zu strömen, sich eine lineare Anode (54), die sich längs einer Wand (56) des Durchgangs (48), in Längsrichtung des Streifens (4) und in einer gegenüberliegenden beabstandeten Relation zu den Kontaktbereichen (18) der Anschlüsse (2) erstreckt, zur galvanischen Abscheidung einer Kontaktmetall-Beschichtung auf der Kontaktzone (18) eines jeden Anschlusses (2) und Teilen (24, 26) der Vorderfläche des Anschlusses (2), die der Kontaktzone (18) benachbart sind, Verwendung findet, wobei die Abscheidung über der Kontaktzone (18) eine abnutzungsresistente Dicke aufweist und sich in ihrer Dicke von der Kontaktzone (18) weg verringert, dadurch gekennzeichnet, daß der Streifen (4) von Anschlüssen (2) kontinuierlich durch den Durchgang (48) in der Zelle (34) und in Längsrichtung der Anode (54) hindurchgeführt wird, die in einer Wand (56) des Durchgangs (48) so eingebettet ist, daß nur die Arbeitsfläche (55) der Anode (54) freiliegt und eine Breite besitzt, die kleiner als die einer jeden Kontaktzone (18) ist, daß der sich bewegende Streifen (4) von Anschlüssen durch Seitenwände (50, 58) des Durchgangs (48) an einer Bewegung zur Anode (54) hin oder von dieser weg gehindert wird, um die Kontaktzonen (18) der Anschlüsse (2) von der Anode (54) in einem Abstand zu halten, der so klein wie möglich ist, ohne daß die Anode (54) mit den Kontaktzonen (18) in Berührung kommt, daß die Strömungsrate des Elektrolyten durch den Durchgang (48) genügend groß ist, um eine Turbulenz in dem Elektrolyten zu erzeugen, und daß der elektrische Strom, der von der Anode (54) zum Streifen (4) von Anschlüssen (2) fließt, eine maximale Stärke erreicht, bei der ein "Verbrennen" (wie in der Beschreibung definiert) der Beschichtung vermieden wird.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß die Kontaktzonen (18) der Anschlüsse von der Anode (54) jeweils um einen Abstand von etwa 1,27 mm beabstandet sind.

6. Verfahren nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß die Scheitelstromdichte bzw. maximale Stromdichte über den Kontaktoberflächen (18) der Anschlüsse (2) im Bereich von 200 bis 1000 Ampère pro 929 cm² liegt und daß die Strömungsrate des Elektrolyten im wesentlichen 3 m pro Sekunde beträgt.

7. Verfahren nach Anspruch 4, 5 oder 6, dadurch gekennzeichnet, daß der Streifen (4) durch den Durchgang (54) mit einer Geschwindigkeit von 1,2 bis 4,5 m pro Minute hindurchgeführt wird.

8. Vorrichtung zur galvanischen Beschichtung eines jeden Anschlusses (2) eines kontinuierlichen Streifens (4) aus gestanzten und geformten, identischen, langgestreckten elektrischen Anschlüssen (2), wobei der Streifen von Anschlüssen (4) einen kontinuierlichen Trägerstreifen (6) umfaßt, von dem die Anschlüsse (2) in beabstandeter, nebeneinander angeordneter Relation abstehen, wobei jeder Anschluß (2) eine Frontfläche (13) und eine hintere Fläche (32) umfaßt, die durch Seitenkanten (28, 30) miteinander verbunden sind, und wobei eine Kontaktzone (18) des Anschlusses (2) die vordere Fläche von einer Seitenkante (28, 30) zur anderen Seitenkante (28, 30) überspannt, wobei schließlich die Vorrichtung eine galvanische Beschichtungszelle (34), einen Durchgang (48) in der Zelle (34), eine lineare Anode (54), die sich längs einer ersten Wand (56) des Durchgangs (48) erstreckt, eine Vorrichtung (50, 58) zum Tragen des Streifens (4) von Anschlüssen (2) mit den Kontaktzonen (18) der Anschlüsse (2) gegenüber der Anode (54), eine Vorrichtung zum Zuführen von galvanischem Beschichtungsstrom zur Anode (54) und zum Streifen (4) aus Anschlüssen (2) und eine Einrichtung umfaßt, die dazu dient, einen Elektrolyten durch den Durchgang (48) strömen zu lassen, dadurch gekennzeichnet, daß eine Vorrichtung zum Transportieren des Streifens (4) von Anschlüssen (2) durch den Durchgang (48) und in Längsrichtung der Anode vorgesehen ist, daß eine zweite Wand (58) des Durchgangs (48) der ersten Wand (56) des Durchgangs gegenüber angeordnet ist, daß die erste und die zweite Wand (56, 58) so angeordnet sind, daß sie den Streifen (4) von Anschlüssen (2) zwischen sich im wesentlichen in einer vorgegebenen Ebene unschließen, daß ein Kanal (57) in der ersten Wand (56) die Anode (54) so aufnimmt, daß die Arbeitsoberfläche (55) der Anode (54) im wesentlichen mit der ersten Wand (56) fluchtet, daß die Breite der Anode im wesentlichen 0,5 mm beträgt und daß die Wände (56 und 58) so geformt und bemessen sind, daß die Kontaktoberflächen (18) der Anschlüsse (2) in unmittelbarer Nähe der Arbeitsoberfläche der Anode (54) vorbeilaufen, wenn der Streifen (4) von Anschlüssen (2) durch den Durchgang (48) hindurchgeführt wird.

9. Vorrichtung nach Anspruch 8, dadurch ge-



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kennzeichnet, daß die erste Wand (56) eine Vertiefung (52) umfaßt, daß die erste Wand und die Vertiefung mit der zweiten Wand (58) zusammenwirken, um den Durchgang 48 zu umgrenzen, wobei die zweite Wand (58) einen Vorsprung (62) aufweist, der gegenüber der Vertiefung (52) angeordnet ist, daß eine Ecke bzw. Kante (157) der Vertiefung (52) mit dem Vorsprung (62) zusammenwirkt, um den Streifen (4) von Anschlüssen (2) bezüglich der

Anode (54) zu positionieren.

10. Vorrichtung nach Anspruch 8 oder 9, dadurch gekennzeichnet, daß die Anode (54) zwei Anodenabschnitte (64 und 66) umfaßt, von denen jeweils ein Endteil (68) sich in einen Hohlraum (74) in der ersten Wand (56) in Berührungsrelation und in elektrischem Kontakt mit Einrichtungen (78, 80) hineinerstreckt, die dazu dienen, der Anode (54) galvanischen Beschichtungsstrom zuzuführen.

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