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Provisional Specification

Section 4

THE TRANSFER OF LETTERS/NUMBERS/DESIGNS ON TO METAL
BY ELECTROCHEMICAL TECHNIQUES

Council of Scientific and Industrial Research
Rafi Marg, New Delhi 1, India, an Indian
registered body incorporated under the
Registration of Societies Act
(Act XXI of 1860)

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"THE TRANSFER OF LETTERS/NUMBERS/DESIGNS ON
TO METAL BY ELECTROCHEMICAL TECHNIQUES"

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, Rafi
Marg, New Delhi-1, India, an Indian registered body incorporated
under the Registration of Societies Act (Act XXI of 1860).

The following specification describes the nature of
this invention :-

This is an invention by DR. SANKARAN GURUSWAMY,
Scientist, POKKYARATH JAYAKRISHNAN, Junior Scientific Assistant
VENKATARAMAN YEGNARAMAN and NELLAYAPPAN SHANMUGAM, Senior
Laboratory Assistants, and RAMASWAMY IYENGAR UPPILLI, Senior
Technical Assistant, all of the Central Electrochemical
Research Institute, Karaikudi-3, (Tamil Nadu) India, all
Indian citizens.

The following specification describes the nature of this invention
This is an invention by Dr. Sankaran Guruswamy, Scientist, Pok-
kyarath Jayakrishnan, Junior Scientific Assistant, Venkataraman Yegna-
raman and Nelayappan Shanmugam, Senior Laboratory Assistants and
Ramaswamy Iyengar Uppili, Senior Technical Assistant, all employed in
the Central Electrochemical Research Institute, Karaikudi 3 (Tamil
Nadu) - all Indian Citizens.

This invention relates to the method of transfer of letters/
numbers/designs on to metal by electrochemical techniques.

The conventional method of preparing letters/designs/numbers over
metal consists of copying the design over metals by suitable lacquer
manually and etching the metal not covered by the lacquer chemically.

The object of this invention is to obviate the disadvantages of
manual copying of the design over the metal, the chemical etching of
the metal and to cover the exposed metal by coloured electro-organic
coating so as to enhance the contrast between the design and the metal

To these ends, the invention broadly consists in a) preparing a
high contrast black and white negative from a good white and black
drawing of the designs to be transferred, b) applying a photosensitive
resist over the metal, c) exposing the metal to ultraviolet light for
a controlled period of time, d) develop the photographic image formed
over the metal, e) heating the image formed to improve the adherent
nature and electrical insulation property, f) etching and/or covering
the uncovered metal electrochemically or electrophoretically deposit
a coloured resin over the metal, g) heating the metal plate to deve-
lop adhesion and curing of the electrodeposited resin, h) dissolving
the photoresist by suitable solvents, i) and etching and/or covering
the uncovered metal over the designs electrochemically or electro-
phoretically deposit a different coloured resin to increase the con-
trast, j) to heat the metal plate finally to develop adhesion and the
curing of the resin deposited in the second case. In many cases, the
insulating layer of the photoresist gives a clear contrast with the
surrounding metal suitably electrocoated with an organic resin as in
the specimen enclosed. In such cases, the steps from (h) to (j) above
are not necessary.

The following Indian Patents 111691; 118256 (1968), 118016 (1968)
and 131636 (1971) go into the practical details of the electrochemical
marking of metals and alloys like mild steel, aluminium, silver,
stainless steel, brass and others and are based on a) the electrochemi-
cal etching of the anode by chloride ion, b) the solubility of chlo-
rides of the metals other than silver and c) the deposition of complex
organic compounds formed by the action of electric current on poly-
vinyl alcohol and potassium dichromate. The information contained in
the said patents are of help in carrying out electrochemical etching/
marking of metals in a rapid manner (3 to 60 seconds depending on the
metal and the depth of etching required etc.). The following Indian
patents 129570 (1971); 130472 (1971); 132089 (1971); 132715 (1971) and
132896 (1971) and another one on coloured electro-organic coatings go
into the practical details of preparing electro-organic coatings of
different colours over metals.

In this patent, we are combining the information contained in the above referred patents to prepare metal plates for name boards, metal boards with designs, sign boards, metal labels, instrument metal boards etc. The metals that can be used may be of mild steel, aluminium, brass, zinc and others.

The following typical example is given to illustrate the invention:

The enclosed specimen with letters SULPHA DIMIDIN has been prepared as follows:

i) The words SULPHA DIMIDIN were drawn on a drawing sheet using black ink (size of letters 1") and reduced photographically to size of letters 1/4" and a photographic negative prepared.

ii) The photographic negative was kept in contact with the brass plate (size 4" x 1") previously covered with a layer of VISTAK H-Resist (product of Vista Graphics, Hyderabad 29, A.P) and exposed to ultraviolet light from a mercury lamp kept at a distance of 12" from the metal plate for a period of one hour.

iii) The exposed plate was developed using H-Resist developer (product of Vista Graphics) for two minutes and washed in water. At this stage, the letters SULPHA DIMIDIN was clearly visible over the metal.

iv) The brass plate was heated at 150°C for 30 minutes to polymerize the resin-design formed so as to develop an adherent electrically insulating layer of the design on the metal.

v) An electrocoating of the proper shade of colour is deposited over the unexposed brass metal as per details in our Indian Patents 129510 (1971); 130472 (1971); 132089 (1971); 132715 (1971); ~~132825~~ (1971) and another one on coloured electro-organic coatings.

vi) An etching of the surrounding metals can be carried out, if necessary, so as to have a projection of the design as per details given in our Indian Patents 111691, 118256 (1968) and 118016 (1968).

XXX The following are the main advantages of the invention:

1. It has the advantage of speed, clarity and the precision of the photographic reproduction of image on metals from drawing board diagrams.

2. It is capable of being adapted to the needs of design marking of metal articles of industry and commerce.

Dated this 10th day of May, 1972

R. Bhaskarai

PATENTS OFFICER,

Department of Scientific & Industrial Research.

THE PATENTS ACT, 1970.

Complete specification

(Section 10)

"THE TRANSFER OF LETTERS/NUMBERS/DESIGNS ON TO
METAL BY ELECTROCHEMICAL TECHNIQUES"

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, Rafi Marg, E
New Delhi-1, India, and Indian registered body incorporated under the
Registration of Societies Act (Act XXI of 1960).

The following specification particularly describes and
ascertains the nature of this invention and the manner in which
it is to be performed :-

Shas follows :-

This is an invention by Dr.SANKARAN GURUSWAMY, Scientist,
POKKYARATH JAYAKRISHNAN, Junior Scientific Assistant, VENKATARAMAN
YEGHARAMAN and NELLAYAPPAN SHANMUGAN, Senior Laboratory Assistant
and RAMASAMY IYENGAR UPPILI, Senior Technical Assistant, all
of the Central Electrochemical Research Institute, Karaikudi-5,
(Tamilnadu), India, all Indian citizens.

This invention relates to the method of transfer of
letters/numbers/designs on to metal by electrochemical techni-
ques.

The conventional method of preparing letters/designs/
numbers over metal consists of copying the design over metals
by suitable lacquer manually and etching the metal not covered
by the lacquer chemically.

The drawbacks connected with the conventional method of
preparing letters/designs/numbers over metal are i) limit to
the accuracy with which manual copying can be carried out on
metals using lacquer, ii) limitations in carrying out chemical
etching accurately, iii) difficulties in increasing the colour
contrast between the design and the metal.

The object of this invention is to improve the accuracy
in copying of the design on the metal by photographically
transferring the design on the metal, to overcome the limita-
tions in carrying out chemical etching by introducing electro-
chemical techniques and to increase the colour contrast between
the design and the metal by covering the exposed metal with
coloured electro-organic coatings.

According to the present invention, there is provided
a process for the transfer of letters/numbers/designs on to
metals by electrochemical techniques which consists in preparing
a photographic negative of the letters/numbers/designs and
keeping it in contact with the metal substrate previously
covered with a layer of photosensitive lacquer as herein
described and exposing it to ultraviolet light from a mercury
lamp kept at a distance of 12" from the resin covered surface
of the metal plate for a period of one hour, the exposed plate
is then developed ^{using a developer} as herein described for two minutes and
washed in water so that an electrically insulating image of
the letters/numbers/designs is clearly visible over the
surface of photosensitive resin covering the metal, the

metal plate is heated at 150°C for 30 minutes to polymerise the resin so as to increase the electrical insulation of the transferred letters/numbers/designs on the metal, an electro-coating of the proper shade of colour is then obtained over the metal in places other than the electrically insulating image of the letters/designs/numbers.

The steps of the process are:-

(a) preparing a high contrast black and white negative from a good white and black drawing of the designs to be transferred, (b) applying a photosensitive insulating lacquer over the metal, (c) exposing the covered surface of the metal to ultraviolet light for a controlled period of time, (d) developing the photographic image formed on the photosensitive layer of the lacquer applied on the metal with the help of photographic developers and washing the developed image so as to obtain an electrically insulating image of the letters/numbers/designs, (e) heating the image formed to improve its adherent nature and electrical insulation property, (f) etching and/or covering the metal portion of the resin coated surface which is not covered by the design electrochemically or electrophoretically deposit a coloured resin over the metal, (g) heating the resin-covered metal plate to develop adhesion and curing of the electrodeposited resin, (h) dissolving the photoresist by suitable solvents, (i) etching and/or covering the uncovered design portion of the metal electrochemically or electrophoretically to deposit a different coloured resin to increase the contrast, (j) to heat the metal plate finally to develop adhesion and the curing of the resin deposited in the latter case. In many cases, the insulating layer of the photoresist gives a clear contrast with the surrounding metal suitably electro-coated with an organic resin (by the steps f and g). In such cases, the steps from (h) to (j) above are not necessary.

The following Indian Patents 111691; 118256 (1968), 118016 (1968) and 131636 (1971) go into the practical details of the electrochemical marking of metals and alloys like mild steel, aluminium, silver, stainless steel, brass and others, and are based on (a) the electrochemical etching of the anode by chloride ion, (b) the solubility of chlorides of the metals other than silver and (c) the deposition of complex organic compounds formed by the action of electric current on poly-vinyl alcohol and potassium dichromate. The following Indian Patents 129510 (1971); 130472 (1971); 132089 (1971); ~~132895 (1971)~~ and 272/72^(Serial No 3734/r) go into the practical details of preparing electro-organic coatings of different colours over metals.

In this specification, we are combining the informations contained in the above referred patents to prepare metal plates for name boards, metal boards with designs, sign boards, metal labels, instrument metal boards etc. The metals that can be used may be of mild steel, aluminium, brass, zinc and others.

The present invention consists of a process which comprises copying of letters/numbers/designs over metals by a suitable lacquer and etching the metal not covered by lacquer, wherein the letters/numbers/designs are transferred photographically over the metal and the metal that is not covered by the lacquer is etched electrochemically or covered by electro-organic coatings so as to enhance the contrast between the design and the metal.

The following typical example is given to illustrate the invention:

A metal specimen with letters SULPHA DIMIDIN is prepared as follows:

1) The words SULPHADIMIDIN are drawn on a drawing sheet using black ink (size of letters 1") and reduced photographically to size of letters ¼" and a photographic negative prepared.

ii) The photographic negative is kept in contact with the brass plate (size 5" x 1") previously covered with a layer of VISTAK H-Resist (product of Vista Graphics, Hyderabad 29, A.P) and exposed to ultraviolet light from a mercury lamp kept at a distance of 12" from the resin covered surface of metal plate for a period of one hour.

iii) The exposed plate is developed using H.Resist developer (Product of Vista Graphics) for two minutes and washed in water so that an electrically insulating image of the letters SULPHADIMIDIN is clearly visible over the surface of photosensitive resin covering metal.

iv) The brass plate was heated at 150°C for 30 minutes to polymerize the resin - design formed so as to increase the electrical insulation of the image of the letters on the metal.

v) An electrocoating of the proper shade of colour is obtained over the brass metal in places other than the electrically insulating image of the letters as per details given in our Indian Patents 129510 (1970); 130472 (1971); 132089 (1971); 272/72 (1972) (As per details given in the attached drawings).

vi) An etching of the surrounding metals can be carried out, if necessary, so as to have a projection of the design as per details given in our Indian Patents 118256 (1968) and 118016 (1968).

vii) If further contrast is necessary the insulating photoresist layer can be removed by suitable organic solvent and a different coloured organic coating can be given electro-phoretically and heated for baking the same.

• The following are the main advantages of the invention:

1) It has the advantage of speed, clarity and the precision of the photographic reproduction of image on metals from drawing board diagrams.

2) It is capable of being adapted to the needs of design marking of metal articles of industry and commerce.

In this invention, we transfer photographically any combination of letters/numbers/designs using photosensitive lacquer and electrochemically etch the unexposed metal or cover the exposed metal by electro-organic coating so as to enhance the contrast between the design and the metal.

We claim

1) A process for the transfer of letters/numbers/designs on to metals by electrochemical techniques which consists in preparing a photographic negative of the letters/numbers/designs and keeping it in contact with the metal substrate previously covered with a layer of photosensitive lacquer as herein described and exposing it to ultraviolet light from a mercury lamp kept at a distance of 12" from the resin covered surface of the metal plate for a period of one hour, the exposed plate is then developed (as herein described for two minutes and washed in water so that an electrically insulating image of the letters/numbers/designs is clearly visible over the surface of photosensitive resin covering the metal, the metal plate is heated at 150°C for 30 minutes to polymerise the resin so as to increase the electrical insulation of the transferred letters/numbers/designs on the metal, an electrocoating of the proper shade of colour is then obtained over the metal in places other than the electrically insulating image of the letters/designs/numbers.

2) A process as claimed in claim 1 wherein a uniform coating of the photosensitive lacquer is applied over the metal surface, exposing the lacquer - coated surface to ultra violet light through the photographic negative of the desired letters/numbers/designs and developing the letters/numbers/designs with the help of photographic developers, and washing the developed image, so as to obtain an electrically insulating image of the letters/numbers/

designs on the metal.

3) A process as claimed in claim 1 and 2 wherein an etching of the surrounding (conducting) metal is carried out so as to have a projection of the letters/numbers/designs on the metal.

4) A process as claimed in any of the preceding claims wherein an electrocoating of desired shade of colour is obtained over the metal in places other than the electrically insulating image of the letters/numbers/designs so as to enhance the contrast between the metal and the design.

5) A process for the transfer of letters/numbers/designs on to metals substantially as herein before described.

Dated this 25th day of May, 1973

PATENTS OFFICER,
COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH