GOVERNMENT OF INDIA : THE PATENT OFFICE, 214, ACHARYA JAGADISH BOSE ROAD, CALCUTTA-17.

Specification No. 111691. Application No. 111691 Dated 27th July, 1967. Complete specification left on 16th April, 1968. Application accepted 12th March, 1969.

Index at acceptance—70B+C5[LVIII(5)]

PROVISIONAL SPECIFICATION

"IMPROVEMENTS IN OR RELATING TO THE ELCTROCHEMICAL MARKING ON METALS"

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, AND DR. GOLLAKOTA PRABHA KARA RAO, SCIENTIST, BOTH OF THE CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAIKUDI-3, MADRAS STATE, INDIA, BOTH INDIAN CITIZENS.

This invention relates to improvements in or relating to the electrochemical marking on metals.

Either to it has been proposed to mark metals by an electro-chemical process involving the use of suitable electrodes, stamping pad, electrolytes and stencils. Full details of the process, however, are not available. The necessary know-how and equipment for the work will have to be imported.

This is open to objection that the import of the equipment involves foreign exchange and dependence on a couple of foreign commercial firms who have the necessary technical know-how on the subject.

The object of this invention is to obviate these disadvantages by developing indigenous know-how on the subject and designing suitable equipment for the work.

To these ends, the invention broadly consists in (i) the design of suitable absorbent pad with electrodes to hold electrolytes and capable of carrying a current of density 1 to 10 amperes per sq. cm. in the voltage range 5 to 25 volts A. C. and/or D.C., (ii) the use of suitable combination of electrolytes, mineral acids, oxidizing agents and organic chemicals comprising of chlorides, chromates, manganates, borates, hydroxides and sulphates of iron, copper, alkali and alkaline earth metals in concentrations ranging from 2 to 20% and of organic acids like salicylic, benzoic, tartaric and others in concentrations ranging from 0.5 to 10% to effect the etch and/or deposit of the metal, (iii) the development of suitable stenciling device, and (iv) the application of technical know-how to the continuous marking of a given design on mild steel, stainless steel, galvanized iron, brass, tin, aluminium and other metal articles of industry and commerce.

The following typical examples are given to illustrate the invention :

Example 1

An etch mark ITC (Is - 1964) is made on a galvanized steel pipe 3" diameter by passing a D. C. current of density 4 amps/sq. cm. of anode surface at a voltage of 15 volts in about 40 seconds using a combination of ferric chloride (7.5%), sodium chloride (5%), sulphuric acid (1N).

Example 2

An each/deposit mark CECRI is made on mild steel plate (free from mill scale) by passing a A. C. current of density 4 amps./sq. cm. of anode surface at a voltage of 15 volts in about 15 seconds using combination of sodium chloride (10%), sodium hydroxide (5%) and benzoic acid (1%).

Similar etch and etch/deposit marks are obtained on stainless steel, brass, tin and aluminium.

The following are among the main advantages of the invention :

1. It has the advantages of speed, clarity, permanence, ease of production and, minimum damage to the underlying metal.

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

3. It is possible to transfer hand-written or typed letters on metals.

Dated this 19th day of July, 1967.

Sd./-
(R. BHASKAR PAI)
Patent Officer,
Council of Scientific & Industrial Research.

COMPLETE SPECIFICATION

IMPROVEMENTS IN OR RELATING TO THE ELECTROCHEMICAL MARKING OF METALS

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 particularly describes and ascertains the nature of this invention and the manner in which it is to be performed :—

This is an invention by DR. SANKARAN GURUSWAMY Scientist, and Dr. GOLLAKOTA PRABHAKARA RAO, Scientist, both of the Central Electrochemical Research Institute, Karaikudi-3, Madras State, India, both Indian Citizens.

This invention relates to improvements in or relating to the electrochemical marking of metals.

The method of electrochemical marking on metals is employed at present for transferring letters, designs and numbers on metal so that metal articles of industry and commerce are marked for the purpose of identification, certificate of quality and for advertisement. The method has the advantage of speed, clarity, permanence, ease of reproduction and minimum damage to the underlying metal.

Full details of the method are, however, not available. The necessary equipment and know-how for the process will have to be imported involving foreign exchange and dependence on foreign firms. The main object of this invention is to develop indigenous know-how on the subject.

Price : TWO RUPEES.

According to the present invention, the method of electro-chemical marking on metals consists in passing an electric current through an electrode holder, an absorbent pad soaked with a solution of a mixture of electrolytes and a stencil on to the metal to be marked whereby a design is transferred by passing a current between the holder and the metal article on which the marking is to be made.

The electrode holder for electrochemical marking on metal comprises

(a) a metal electrode, which serves as a lead for a current,

(b) a metal plate, which serves to distribute the current.

The metal electrode is in contact with the plate and the absorbent pad soaked with a solution of a mixture of electrolytes, along with a stencil.

The absorbent pad soaked with a mixture of electrolyte has the metal electrode on one side and the metal to be marked on the other side through the stencil, whereby the absorbent pad serves as a medium for conducting the current for electrochemical marking.

Electrolytes for electrochemical marking have the following proportion ranges

Ferric chloride	5 — 10 gms.	in 100 c.c. of 1N sulphuric acid.
Sodium chloride	5 — 10 gms.	
Sodium hydroxide	5 — 10 gms.	in 100 cc of water
Benzoic acid	0.5 to 1.5 gms.	
Sodium chloride	5 — 10 gms.	

The invention will now be described in detail. Description of the electrode holder will be given first and later the actual process of marking on the metal surface will be illustrated in detail making use of the electrode holder and the stencil sheet.

Fig. 1 of accompanying drawing illustrates the construction details of the electrode holder. It is made of mild steel and is circular in cross section. It may also be rectangular or square in cross section and may also be made of other metals according to requirements. It is closed at one end and is open at the other. A metal electrode (5) is fixed to the closed end of the holder by a screw arrangement (4) and is movable through the closed end of the holder. The movement of the screw inside the holder enables one to control the position of the perforated metal plate (6) which is fixed to the bottom of the electrode (5). The perforations in the metal plate allow the escape of gases that may be formed during marking operation. The gases escape into the atmosphere through a small hole located on the closed end of the holder (1).

The open end of the holder serves to introduce the absorbing pad (7) into the holder. The absorbent pad is made of cotton. The pad is held secure to the electrode holder by means of a piece of absorbent cloth such as cotton cloth (3) and a metal ring (2). The latter is fixed over a recess cut along the edge of the electrode holder.

By making use of the electrode holder that is described above and a plastic stencil (8) on which desired letters, numbers and/or designs are cut, markings can be made on metal surfaces (9). Plastic stencils are prepared both from flexible films and fairly rigid sheets. The flexible stencils are especially suited for marking on curved surfaces such as metal tubes, whereas rigid as well as flexible plastic stencils serve well for marking plain surface such as metal plates. The cut portions on the plastic stencil allow the passage of current between the electrode holder (1) and the metal surface (9) on which markings are to be made.

The process of actual marking on metals will now be described:

The absorbent pad (7) is soaked with an electrolyte solution and held firm to the electrode holder by a cloth (3) and ring (2). The stencil (8) on which the given design has been cut is placed over the metal to be marked (9). The electrode holder (1 is in turn placed over the stencil (8). Direct current is passed between the electrode holder (1) and the metal to be marked (9); the metal to be marked is made the anode. The voltage is adjusted to 15 volts; the actual current flow depending on stencil area and the conductivity of the pad and is of the order of 4 amps/sq. cm. The time of marking depends on the depth of etching desired and is 40 seconds for a satisfactory etch mark on mild and galvanized steel.

It is necessary to impart a rocking movement to the electrode holder while the current is being passed. The rocking motion simply consists of turning the electrode holder forward and backward slowly over the design on the stencil and this ensures a uniform current flow throughout the operation. The rocking movement is found to be essential for getting a good electrochemical marking on the metal.

When a alternating current is used in the above operation, markings can be effected in a shorter time (of the order of 15 seconds). The nature of the mark is an etch/deposit when alternating current is used. The voltage employed is 15 volts and the current is of the order of 4 amps./sq. cm.

The following are typical compositions of electrolytes for etch as well as etch/deposit markings.

For etch marks on galvanized steel and mild steel		For etch/deposit mark on mild steel	
Ferric chloride and sodium chloride	7.5 gms.	Sodium chloride	10 gms
		Sodium hydroxide	5 gms
		and benzoic acid	1 gm.
dissolved in of 1 N sulphuric acid	5.0 gms. 100 c.c.	dissolved in of water.	100 c.c.

WE CLAIM:

1. A method of electrochemical marking on metals which consists in passing an electric current through an electrode holder, an absorbent pad soaked with a solution of a mixture of electrolytes and a stencil on to the metal to be marked whereby a design is transferred by passing a current between the holder and the metal article on which the marking is to be made.

2. An electrode holder for a electrochemical marking on metal as claimed in claim 1, which comprises

(a) metal electrode, which serves as a lead for a current,

(b) a metal plate, which serves to distribute the current.

3. An electrode holder as claimed in Claim 2 wherein the metal electrode is in contact with the metal plate and the absorbent pad soaked with a solution of a mixture of electrolytes, along with a stencil.

4. A device as claimed in Claim 2 or 3, wherein the absorbent pad soaked with a mixture of electrolyte has the metal electrode on one side and the metal to be marked on the other side through the stencil, whereby the absorbent pad serves as a medium for conducting the current for electrochemical marking.

5. A method as claimed in Claim 1 wherein are used electrolytes for electrochemical marking having the following proportion ranges

Ferric chloride	5—10 gms.	in 100 c.c. of 1 N sulphuric acid.
Sodium chloride	5—10 gms.	
Sodium hydroxide	5—10 gms.	in 100 c.c. of water.
Benzoic acid	0.5 to 1.5 gms.	
Sodium chloride	5—10 gms.	

Dated this 6th day of April, 1968.

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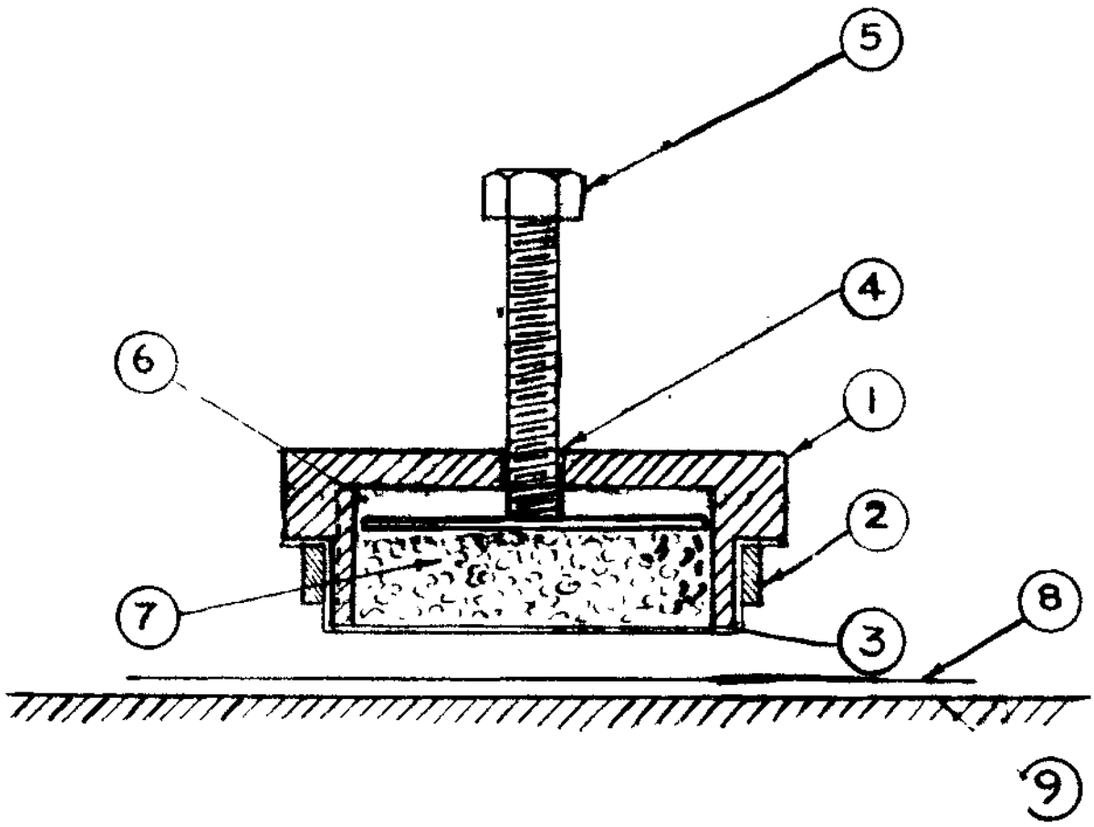

(R.B. PAI)
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