GOVERNMENT OF INDIA : THE PATENT OFFICE, 214, LOWER CIRCULAR ROAD, CALCUTTA-17.

IMPROVEMENTS IN OR RELATING TO THE PROTECTION OF METALLIC SURFACES AGAINST ATMOSPHERIC CORROSION.

PROVISIONAL SPECIFICATION

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, OLD MILL ROAD, NEW DELHI-1, INDIA, AN INDIAN REGISTRATION BODY INCORPORATED UNDER THE REGISTRATION OF SOCIETIES ACT (Act XXXI of 1860).

The following specification describes the nature of this invention.

This invention is an invention of KUMMATHYTHILAL SANTHANAM RAGHOPALAN, AND GANAPATHY RAMASESHAN, BOTH OF THE CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE, KARAKONAM, MADRAS, INDIA, BOTH INDIAN CITIZENS.

This invention relates to improvements in or relating to the protection of metallic surfaces against atmospheric corrosion during storage and transportation. The metal parts are usually housed, packaged, boxed and enveloped under such conditions that water vapour and air are either already present or enter later through packaging material. The invention has particular reference to preventing the corrosion of steel or ferrous metal during storage, handling and transportation.

The object of the present invention is to provide a method of preventing the corrosion of metallic surfaces which will be cheap, will employ readily available materials and which will be particularly useful for protection against atmospheric conditions usually met with in this country.

We have found that meta-dinitrobenzene or beta-napthol can be used for the protection of packaged metal parts from humid atmospheric conditions and from humid atmospheres containing salt pollution.

The process for protecting metal surfaces against corrosion consists according to the present invention in exposing them to an atmosphere which contains meta-dinitrobenzene or beta-napthol in the form of vapour. The corrosion inhibitors (namely, m-dinitrobenzene or beta-napthol) can be introduced inside the system in several ways e.g., as coating on packaging material or powder. Objects to be protected against corrosion may be closed entirely or practically entirely. The closed space may be a drum, a warehouse, a room or formed by covering wrapping the metal object with suitable packing material. The packaging material may be paper, card-board, paper reinforced with plastic materials or wax paper. A preferred embodiment of this process comprises coating of the volatile inhibitor on the packaging material or as an impregnant on the packaging materials.

The amount of inhibitor required will vary depending upon the severity of conditions under which it is to be employed, the particular inhibitor utilized and the manner in which it is used. For general purposes, ordinary paper wrappings such as commonly employed in packaging metal articles will provide satisfactory inhibition against corrosion by moisture condensation within the package if the wrapping is coated with 1 gm. to 5 gms. of inhibitor/kg. of packing material. It has been found that optimum protection is obtained from the vapour phase inhibitors if the distance between the inhibitor coated paper and the metal surface is not more than 6".

The effectiveness of the vapour phase inhibitors covered by this invention is shown by the following data.

Protection given to Steel.

Method of Test.

500 cc. bottles containing constant humidity solutions to a depth of 7" are taken and cylindrical pieces of filter paper impregnated with inhibitor to the extent of 1gm./sq. ft. are introduced inside these bottles such that they are situated 2 or 3 inches above the level of the humidity solutions. Mild steel test specimens are then suspended inside the bottles by Nichrome wires hooked fixed to the rubber closures such that they do not touch the paper and are equidistant from the paper in all directions. The bottles are closed and left inside an air thermostat for a period of one month at the end of which the steel specimens are taken out and their condition examined. In one set of experiments the steel specimens are also impregnated with dry sodium chloride particles before introduction into the bottles. Under these conditions the absence of inhibition, the steel specimens are completely covered with rust. Besides obtained with the chemicals, the use of which is covered by this specification, are given in Table I.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Chemical</th>
<th>Condition of specimens at the end of test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>When inoculated with salt at</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90% RH</td>
</tr>
<tr>
<td>1.</td>
<td>m-Dinitrobenzene</td>
<td>Rusting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>confined</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to where</td>
</tr>
<tr>
<td></td>
<td></td>
<td>salt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>salt</td>
</tr>
<tr>
<td>2.</td>
<td>Beta-napthol</td>
<td>Slight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rusting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>at places</td>
</tr>
<tr>
<td></td>
<td></td>
<td>where salt</td>
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<tr>
<td></td>
<td></td>
<td>nuclei</td>
</tr>
</tbody>
</table>

The invention process is particularly useful for anti-corrosion packaging of metal stores and protecting during handling, storage and transportation under atmospheric conditions prevailing inside packages in the coastal areas of the country.

The coating or impregnation of filter paper or packing material according to the invention by cheaply available chemicals is likely to result in the production of large quantities of such papers and packing material for the protection of packaged metal parts under humid atmospheric conditions. The invention is, therefore, of considerable utility to all those who deal in large stocks of metallic stores.

Price : TWO RUPEES.

R. BHASKAR PAL,
Patent Officer.

Council of Scientific & Industrial Research.

Dated this 6th day of July 1959.
COMPLETE SPECIFICATION

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, OLD MALL ROAD, NEW DELHI 1, INDIA, AN
INDIAN RESEARCH BODY INCORPORATED UNDER THE INDIAN RESEARCH ACT (XCI.XXI.) OF 1948

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

SANTHANAM RAJAGOPALAN and GANAPATHY
RESEARCH INSTITUTE, KADAVUTT, MADURAI, MADRAS, INDIA, BOTH

Indian citizens

The invention relates to improvements in or relating to the prevention of metallic surfaces against atmospheric
corrosion during storage and transportation. The metal parts are usually housed, packaged, boxed and enveloped
under such conditions that water vapor and air are either
already present or enter later through packaging material. The invention has particular reference to preventing the
corrosion of steel or ferrous metal during storage, handling
and transportation.

The object of the present invention is to provide a method of preventing the corrosion of metallic
parts which will be cheap, which will employ readily available
materials and which will be particularly useful for protec
tion against atmospheric conditions usually met with in this
country.

We have found that metal dinitrobenzene and beta
naphtol can be used for the protection of packaged metal
parts from humidity atmospheric conditions and from brumous
atmospheres containing salt pollution.

The process for protecting metal surfaces against
corrosion consists according to the present invention in
exposing them to an atmosphere which contains m-dinitro-
benzene or beta naphtol in the form of vapor. The
corrosion inhibitor (namely, m-dinitrobenzene or beta-
naphtol) can be introduced inside the system in several
ways, e.g., by coating on packaging material or as powder.
The preferred method of application of the inhibitor on
packaging material is to spray a solution of the inhibitor in a
volatile solvent containing the required amount of inhibitor
and an adhesive material.

Objects to be protected against corrosion may be closed
entirely or practically entirely. The enclosed space may be
a drum, a warehouse, a room or formed by covering,
wrapping the metal object with suitable packaging material.
The packaging material may be paper, cardboard, paper
reinforced with plastic materials or waxed fabrics. A
preferred embodiment of the process comprises coating of
the volatile inhibitor on the packaging material or as an
imregnant on packaging materials.

The amount of inhibitor required will vary depending
upon the severity of conditions under which it is to be
employed, the particular inhibitor utilized and the manner
in which it is used. For general purposes, ordinary paper
wrapping such as commonly employed in packaging metallic
articles will provide satisfactory inhibition against corrosion
by moisture conditions wherein the package of the wrapping
is coated with 1 gm. to 5 gms. of inhibitor/1 sq. ft of
packaging material. It has been found that optimum protec-
tion is obtained from the vapor phase inhibitors if the distance
between the inhibitor coated paper and the metal
surface is not more than 6”.

The effectiveness of the vapor phase inhibitors covered
by the invention is shown by the following data.

<table>
<thead>
<tr>
<th>Protection given to Steel</th>
</tr>
</thead>
</table>

Method of Test

600 cc bottles containing constant humidity solutions at a
depth of 8” are taken and cylindrical pieces of filter paper
impregnated with inhibitors to the extent of 1 gm./sq. ft are
introduced inside these bottles such that they are extracted
a few inches above the level of the humidity solutions. Mold
steel test specimens are then suspended inside the bottles by
methylene wicks fixed to the rubber clothes such that
they do not touch the paper and are equivalent from the
paper as all directions. The bottles are closed and in-
mulated at a thermostat for a period of one month at the
end of which the steel specimens are taken out and their
condition examined. In one set of experiments the steel
specimens are also impregnated with dry sodium chloride
particles before introduction into the bottles. Under these
conditions, in the absence of inhibitors, the steel specimens
are completely covered with rust. Results obtained with the
chemicals, the use of which is covered by this specification,
are given in Table 1.

<table>
<thead>
<tr>
<th>Condition of specimens at the end of test</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Chemical</td>
</tr>
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<td></td>
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<td>--------------</td>
</tr>
</tbody>
</table>
| 1. m-Dinitro-
  benzene | Rusting confined to | Unaffected |
  naphthol | where salt nuclei | except for slight |
  naphthol | are present. | rusting at suspension |
| 2. beta-naphtol | Slightly rusting | Unaffected |
  at places | at places |
  where salt | salt nuclei |
  nuclei | are present. |

The invention process is particularly useful for anti-
corrosion packaging of metal stores and protection during
handling, storage and transportation under atmospheric
conditions prevailing made packages in the coastal areas of
the country.

The coating or impregnation on filter paper or packing
material according to our invention by cheaply available
chemicals is likely to result in the production of large
quantities of cheap papers and packing material for the
protection of packaged metal parts under humid atmos-
pheric conditions. The invention, therefore, of consider-
able utility to all those who deal in large stores of metallic
stores.

We claim -
1. A process for the protection of metallic surfaces
against atmospheric corrosion which consists in exposing
them to an atmosphere which contains m-dinitrobenzene or
beta naphtol in the form of vapor
2. A process as claimed in Claim 1 wherein m-dinitro-
  benzene or beta naphtol is introduced as coating or
  impregnating on packaging material or as powder
3. A process as claimed in Claim 1 wherein a solution of
  m-dinitrobenzene or beta naphtol in a volatile solvent
  containing an adhesive material is sprayed on packing
  material
4. A process as claimed in any of the preceding claims
whereas the metallic surfaces to be protected are kept in
an enclosed space such as a drum, a warehouse, a room, or
formed by covering or wrapping the metal object with
packing material such as paper, cardboards, paper reinforced with plastic materials or varnish substances.

5. A process as claimed in any of the preceding claims wherein the packing material, e.g., paper wrappings for packaging metal articles is coated with 2 gm to 5 gms of m-dinitrobenzene or beta-naphthol per square foot of packing material.

6. A process as claimed in any of the preceding claims wherein the distance between the inhibitor coated paper and metal surface is not more than 6 inches to obtain optimum protection.

7. Metal surfaces, particularly of steel or ferrous metal, whenever protected against atmospheric corrosion according to a process substantially as hereinbefore described.

R. DHASKAR PAI,
Patents Officer,
Council of Scientific and Industrial Research,
Dated the 18th day of March 1960.