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## METHODS OF INSULATING METAL SURFACES

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This invention relates to a method of insulating metal surfaces in particular the surfaces of pipes, cables and the like and in accordance with the invention three insulating layers are applied in succession to the metal surface to be insulated.

For insulating pipes and the like spreadable masses consisting of pitch, bitumen, resin, sulphur solution as well as tarred rope and the like have hitherto been chiefly employed. When such insulating materials were used it was found that they became brittle or saponified and did not remain elastic even if oil or other softening agents were added to them. These faults are eliminated by the present invention in that the insulation of the metal surfaces is effected by a plurality of insulating layers which are applied one after the other and of which each fulfils a separate purpose.

The first layer must be very elastic in order to be able to withstand the expansions of the metal surface. Further the first layer must be very resistant to chemical influences without becoming brittle or to hardening, as is the case for example with rubber, rubber compounds, tar and so forth. The second layer must be hard, waterproof and extremely resistant to attack by external chemical influences and must not become corroded even after a long time. The third layer must be acid resistant. When three such layers have been applied the metal surface is perfectly insulated against all external influences which may be encountered.

If, in view of the conditions to which the insulated metal surfaces are to be exposed the second or the third layer is not necessary, it may, of course, be omitted. Thus, for example for the external insulation of pipes the acid resistant layer can be omitted if the pipes are not exposed on the outside to any attack by acids. Again, for the internal insulation of pipes the hard waterproof coating can be omitted since the pipes are not normally exposed on the inside to any corrosive attack by alkaline earths, water or the like. In all cases, however, the elastic coating which is resistant to chemical influences is necessary.

The following is an example of the method of manufacturing a mass which is suitable for forming the first layer or coating.

| | Parts by weight |
|---|---|
| An acid-resistant condensation product, which may be made, for example, from maleic acid or acetylene, dichlorethan, polym. hydro-carbons, is dissolved in polymerised wool fat. Polymerised wool fat as distinguished from commercial wool fat has very great resistance to chemical influences | 1.5–2 |
| Sulphonated asphalt | 1 –1.5 |
| A mixture of dibutyl phthalate with vaseline | 0.1–0.3 |

These materials are mixed and heated and chlorine gas is passed through and caused to enter into reaction or a corresponding amount of chloride of lime is added. There is thus formed a tough elastic mass which is then mixed with 0.8–1.5 parts by weight of very finely ground and washed asbestos fibre and glass wool and dissolved in the usual solvents. The viscous mass obtained is applied to the pipes or the like and on it is wound by means of a suitable apparatus a band of insulating material made of a mineral fabric, for example glass fabric, which may also be coated with the insulating mass.

The following is an example of the method of manufacturing a mass suitable for forming the second layer.

0.400–0.800 parts by weight of a condensation product of phthalic acid anhydride and glycerine are dissolved in sulphonated ammonium oleate and mixed with 1.–1.5 parts by weight of a colloidal solution of potassium or sodium fluoride and silicon hydroxide, to which is added a dissolved lead compound, which may be obtained in accordance with the equations

$$Pb(NO_3)_2+2NaOH=Pb(OH)_2+2NaNO_3$$
$$Pb(OH)^2+NaOH=Pb(OH)(ONa)+H_2O$$

This mixture is diluted with 5–10 times the quantity of water and mixed with cement (ore cement) and sand or asbestos and applied thickly to the pipes, in some cases with wire fabric. It is advantageous, however, to embed the pipes or the like completely in the mass, expansion joints being preferably provided. The expansion joints are later filled with the aforesaid elastic mass.

This fluorine-lead-cement mixture is resistant to alkaline earths and to corrosive liquids. The constituents set to form a solid dense mass which protects the iron. Pipes or the like which have already been damaged by rust can be preserved for years by means of the aforesaid insulation.

The following is an example of the manner in which a mass suitable for forming the third layer can be made.

A mixture is made of about equal parts of a finely washed asbestos fibre, quartz powder, barium sulphate, sodium aluminium fluoride, a small percentage of ammonium persulphate, lead oxide and 1–2 parts of ammonium tri-borate silicate powder or silicate solution. This mixture is dissolved in water or soap suds so that it is capable of being spread or painted on. If a greater proportion of sodium-aluminium fluoride is added the mass becomes capable of being polished. The ammonium persulphate and lead oxide accelerate the setting and make the mass insoluble. The ammonium triborate has a similar effect and also reduces the excess of alkali without precipitating the silicic acid. The mixture has the property of adhering particularly

well. Filling agents such as granulated cork or the like can also be added, in particular when the mass is used for external insulation.

For gas pipes which carry neutral or weakly acid gases an insulation with the first layer is sufficient. If, however, the gases contain stronger acids the last coat of the first layer is dusted with coarse sand and the third and acid resistant layer is applied or is sprayed on by means of compressed air.

For external insulation the first layer alone may be sufficient but in most cases the bottom of the pipe or the like will contain alkaline earths, solids or the like in which case the hard resistant second layer must be applied to the elastic insulation. If attack by acid from the outside is also likely to occur the third acid resistant layer is also applied.

In some cases pipes which are insulated with the first layer can also be laid directly in the second layer.

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