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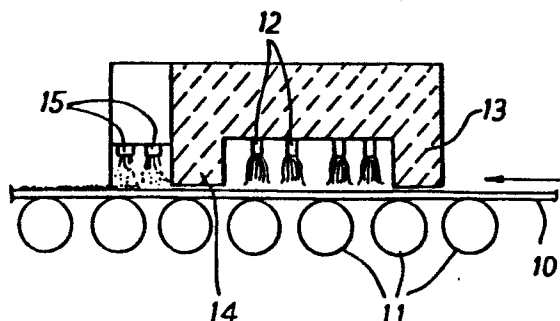
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(54) **Method of treating metal plate.**

(57) A method of treating a surface of a metal plate (10) comprises projecting sharp non-metallic particles at the surface whilst the surface is at a temperature such as to be in a fluid or substantially fluid state. The particles employed are preferably made by forming a mix of particles of granite, feldspathic rock and aluminium oxide with a kaolin or other clay binder, compressing the mix into blocks, firing and crushing the blocks. The blocks may be crushed before or after firing.



"METHOD OF TREATING METAL PLATE"

The present invention relates to surface treatment of metal plates with sharp, non-metallic particles. The principal purpose of this treatment is to render the plates slip proof and thus permit them to be used as decking plates on ships and other locations. However other applications for such plates, such as carriers for abrasives, are also foreseen.

It is already known to coat ship deck plates with a plastic material, incorporating suspended sharp particles. Thus epoxy resin coatings have been loaded with gritstone fillers for that purpose but have been only partially satisfactory in service.

We have now found that an improved non-slip plate can be achieved by avoiding the use of a plastic coating to bond the sharp particles to the metal plate.

In accordance with the present invention we project the sharp non-metallic particles at a metallic plate which has been heated to such an extent that its surface is in a fluid or softened condition at the moment of impact of such particles thereon.

The heating of the metal plate may be carried out in a variety of ways. Preferably however the heating is carried out to effect surface-melting of the plate in a single narrow transverse band which travels along the plate. Such a surface-melted band is most conveniently generated by moving the plate past a heating station at which it is subjected to intense local surface heating by means of, for

example, an array of gas torches, welding electrodes such as are used in tungsten/inert gas welding or plasma torches.

5 The non-metallic particles are projected against the surface of the metal plate either within the narrow band subjected to heating to effect surface melting or in the zone immediately succeeding said band so that the particles strike the metal surface whilst still molten or in a heat-softened condition.

10 The particles should strike the metal surface with sufficient force to embed them firmly in the metal without at the same time submerging the particles to such extent that they project insufficiently from the subsequently solidified metal surface to achieve the
15 result for which they are intended, over a prolonged service life. In general it may be said that satisfactory bonding of the particles into the metal surface will be achieved where rather more than half the volume of the individual particles lie within the
20 metal, but this will vary both with the size of the particles and the shape of such particles.

 It is envisaged that the method of the invention will involve the use of coarse, sharp grit of a particle size in the range of 2 - 5 mm, although
25 particles of smaller size down to 100 microns may be used, preferably in admixture with the envisaged coarse grit, although in some circumstances, these small particles may be used by themselves.

 It is envisaged that the force required to
30 project the particles at the metal plate to achieve

adequate penetration of the metal surface could be generated either by centrifugal action or by means of gas blast. For example the particles may be entrained in a high speed gas stream, which may be
5 air or a stream of an inert gas. The gas may be at room temperature or preheated to avoid excessive chilling of the metal when it strikes the plate. If the gas is preheated then it is preferably of low oxygen content to avoid excessive oxidation of the
10 metal surface. It is estimated that a gas pressure of about 500 p.s.i. will provide a driving force sufficient to ensure adequate particle penetration with particles of the size range already mentioned.

The process of the invention is primarily
15 envisaged as a means for the production of non-slip decking plates for ships as a decking for bridges and other land structures, both for vehicles and pedestrians. One possible application is as a long-life non-slip covering for aircraft runways and taxi-
20 tracks.

Although the process is primarily envisaged as a process for treatment of steel plates, it may also be applied to other metals, such as aluminium, which is extensively used in decking plates.

25 In order to ensure a long service life for slip-proof decking produced by the method in accordance with the present invention it is desirable that the non-metallic particles be themselves chosen with care to ensure that they will remain sharp under the
30 selected service conditions. The particles should

therefore be wear-resistant and resistant to becoming polished.

For the purposes of the present invention we prefer to employ a man-made aggregate, which presents a surface of relatively sharp, hard particles embedded in a somewhat softer matrix. One such material is made by a method which broadly comprises the steps of forming a mix consisting essentially of particles of granite or other feldspathic rock and aluminium oxide particles in the size range of 10 - 50 μ , preferably less than 125 μ , the aluminium oxide forming 2% to 30%, preferably 5% to 15%, of the mix and a clay, preferably kaolin, or other binder, compressing the mix to form coherent "green" blocks and firing the compressed "green" material for a time and temperature sufficient to form the mix into a matrix containing hard sharp alumina particles, the compressed material being comminuted into the form of irregularly shaped, angular chips before or after firing. Preferably the chips are produced by crushing the "green" tiles or slabs and are then fired at a temperature and for a time sufficient to fuse the feldspar to form a matrix in which the alumina and other higher melting point components are embedded. A firing temperature in the range of 1150 $^{\circ}$ - 1300 $^{\circ}$ C is generally satisfactory.

As less preferred alternatives natural or synthetic materials, such as zirconite, emery, corundum, anorthosite, crystalline fused alumina may be employed.

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- One method of putting the invention into effect is illustrated in the accompanying drawing. In this method the sheet or plate 10 is forwarded at a steady rate while supported on rollers 11 past a surface-
- 5 melting station at which a battery of gas burners 12 are positioned in a chamber bounded by a pair of spaced refractory walls 13, 14 extending across the width of the roller table and having bottom edges in close proximity to the surface of the plate.
- 10 Immediately adjacent the refractory wall 14 on the outgoing side a series of particle discharge nozzles 15 are arranged to discharge the grit onto the surface of the plate as it emerges from under the refractory wall.

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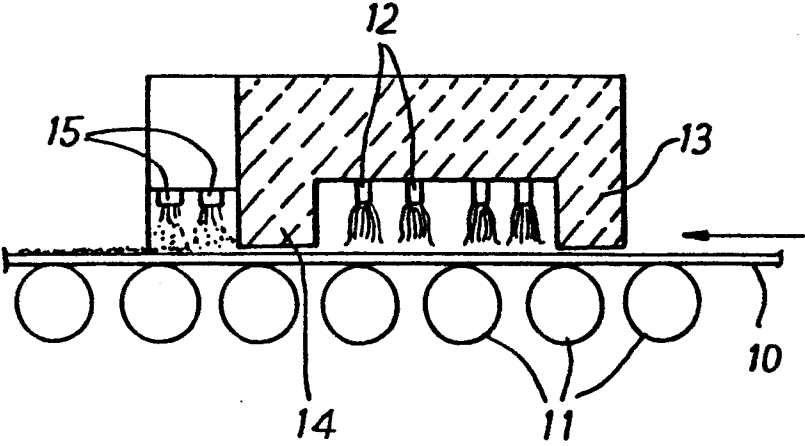
CLAIMS

1. A method of treating a metal plate e.g. a steel or aluminium plate characterised by the step of projecting sharp non-metallic particles on to a surface of the plate which has been heated to such an extent that the surface is in a fluid or substantially fluid state.
2. A method as claimed in claim 1, characterised in that the particle size is in the range 2 to 5 mm.
3. A method as claimed in claim 1 or claim 2, characterised in that the particles are projected on to said surface by centrifugal action.
4. A method as claimed in claim 1 or claim 2, characterised in that the particles are projected on to said surface by a high speed gas stream.
5. A method as claimed in claim 4, characterised in that the gas stream is pre-heated.
6. A method as claimed in any one of claims 1 to 5, characterised in that the particles are produced by forming a mix consisting essentially of particles of granite or other feldspathic rock and aluminium oxide particles in the size range of 10 - 500 μ , preferably less than 125 μ , the aluminium oxide forming 2% to 30%, preferably 5% to 15%, of the mix and a clay, preferably kaolin, or other binder, compressing the mix to form coherent "green" blocks and firing the compressed "green" material for a time and temperature sufficient to form the mix into a matrix containing hard sharp alumina particles, and comminuting the compressed material before or after firing.

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7. A metal plate characterised by a coating of sharp non-metallic particles embedded in the metal surface.

8. A metal plate as claimed in claim 7, characterised in that the particles are produced by forming a mix consisting essentially of particles of granite or other feldspathic rock and aluminium oxide particles in the size range of 10 - 500 μ , preferably less than 125 μ , the aluminium oxide forming 2% to 30%, preferably 5% to 15%, of the mix and a clay, preferably kaolin, or other binder, compressing the mix to form coherent "green" blocks and firing the compressed "green" material for a time and temperature sufficient to form the mix into a matrix containing hard sharp alumina particles, and comminuting the compressed material before or after firing.





European Patent
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EUROPEAN SEARCH REPORT

Application number
EP 79 30 1300

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>US - A - 2 709 213 (G.J. GIBSON)</u> * Claims 1,2,3,5 * --	1,4	B 05 D 1/10 5/02 C 23 C 17/00// E 04 F 15/06 B 24 D 17/00
	<u>US - A - 2 841 687 (K.E. RICHTER)</u> * Claim 4 * --	1	
	<u>US - A - 2 964 419 (H.S. LINK et al.)</u> * Claim 4; column 5, lines 24-33 * --	7	
	<u>US - A - 3 017 689 (H.S. LINK et al.)</u> * Column 1, lines 12-21; column 2, lines 60-70; column 5, lines 54-72 * --	7	TECHNICAL FIELDS SEARCHED (Int. Cl. 3) B 05 D C 23 C E 04 F B 24 D B 23 K9
	<u>GB - A - 1 484 023 (MEBAC INC.)</u> * Claims 1,3,7 * ----	1,4,7	CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons &: member of the same patent family, corresponding document
b The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	09-10-1979	FISCHER	