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(54) **PLEXIGLAS SURFACE WITH ANTI-SLIP PROPERTIES AND SANITARY ELEMENTS EQUIPPED WITH THE LATTER**

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(57) **ABSTRACT**

PLEXIGLAS® is suitable—when provided with a structured and microrough surface —as an anti-slip covering for sanitary elements.

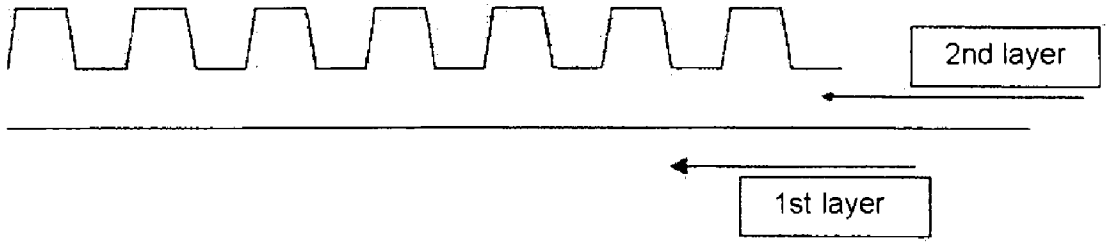


Figure 1

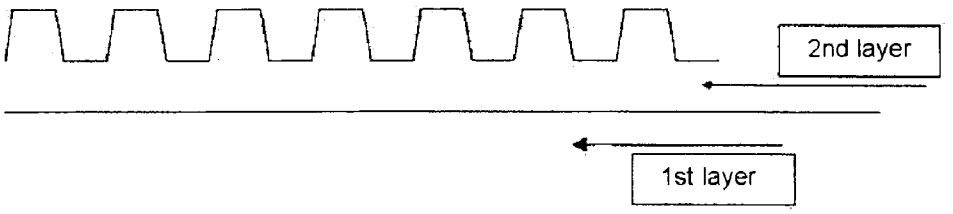
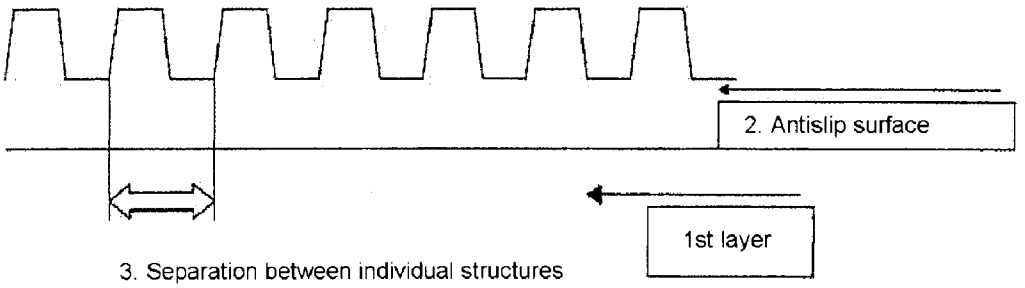


Figure 2


2. Antislip surface
1st layer
3. Separation between individual structures

PLEXIGLAS SURFACE WITH ANTI-SLIP PROPERTIES AND SANITARY ELEMENTS EQUIPPED WITH THE LATTER

FIELD OF THE INVENTION

[0001] The invention relates to antislip sanitary elements, such as bathtubs, shower trays and walkways composed of plastics. Examples of plastics that can be used are cast or extruded acrylic sheet (PMMA), marketed with trademark PLEXIGLAS® GS or PLEXIGLAS® XT by Röhm GmbH & Co. KG.

[0002] Standard thermoplastics can also be used for this purpose, and, by way of example, styrene-acrylonitrile copolymers (SAN), polystyrene (PS), acrylonitrile-butadiene-styrene copolymers (ABS) or else polycarbonate (PC) are used.

[0003] It is also possible to use high-temperature plastics, such as polyphenylene sulphoxide (PPSU).

[0004] The sanitary element can also have been designed as a plastics composite, a decorative layer designed with antislip properties being applied via conventional processes, such as coextrusion or lamination, to a base layer.

[0005] The sanitary item can also, if appropriate, have reinforcement, which is applied in the form of a fibre-containing polymer material to the underside of the sanitary item. The fibre-containing polymer material, such as glass-fibre-reinforced polyester, is applied by way of example through a nozzle onto the underside of the sanitary item.

PRIOR ART

[0006] Antislip sanitary elements are known. "Duschogrip®", an antislip coating from the company Duscholux is described for the entire range of shower trays on page 126 of SI-Informationen 2004 (AT-Fachverlag Fellbach).

[0007] The disadvantage of the said solution is that the antislip coating has to be applied subsequently to the surface of the sanitary element.

[0008] All of the products in the "Purano®" range of superflat designer shower trays from Hüppe also have an antislip coating. Here again, a disadvantage is that the coating has to be applied subsequently to the sanitary article.

[0009] Another disadvantage of coatings is that they undergo more soiling than the remainder of the surface of the sanitary element and are difficult to clean. As yet there is no experience of the durability of the antislip action of subsequently applied coatings.

[0010] U.S. Pat. No. 3,942,199 (Kollsman) describes sanitary elements to which antislip coverings have been applied. These are composed of insular elevations of diameter, for example, 4.5 mm, with 6 mm mutual separation (measured from the centre). The height of the islands is 0.5 mm. No roughness of the surface of the insular elevations is mentioned.

[0011] US-A 2004/0148892 (Kitakado) describes a surface which has subsequently applied structures, for sanitary elements. The structures serve for surface water draining. There is no information about the height of the structures or their distribution or roughness.

[0012] US-A 2002/0146540 (3M, Johnston et al.) describes a subsequently applied film with water-draining structures. The structures serve to promote the draining of water in certain directions. There is no information concerning the height of the structures or their distribution or roughness.

OBJECT

[0013] In the light of the prior art discussed, it was now an object to develop an antislip system which is intended for sanitary elements and which meets the requirements of DIN 51097 "Testing of floor coverings, determination of the antislip properties; wet-loaded barefoot areas; walking method; ramp test" (November 1992) and which is easy to clean, and which does not require the additional coating step for its application, and which can be formed without difficulty with the sanitary element pre-form.

ACHIEVEMENT OF OBJECT

[0014] It has now been found that PLEXIGLAS® GS SW has antislip action (FIG. **1**).

[0015] The surface of the antislip plastics layer has structures, such as pimples, rhombi, rectangles, squares or circles which protrude from the plastics surface. The projecting structures can have regular arrangement over the area, but irregular arrangements are also possible, for example there may be more of the structures in those areas subject to particular loading in the sanitary elements.

[0016] Regular arrangement of the raised structures on the surface is preferred. The separation of the raised structures is from 500 μm to 6000 μm, preferably around 1500 μm and 4500 μm.

[0017] The number of the raised structures is from 1 to 500/cm^2, preferably from 1 to 250/cm^2. The height of the raised structure is from 500 μm to 20 μm.

[0018] However, it has been found that a structure as described above or in U.S. Pat. No. 3,942,199 is not sufficient for classification of the antislip surface in class A to C of DIN 51097. (See Example 1)

[0019] The inventive arrangement has further roughness in addition to the structures described above. The average roughness depth of the roughness (R_a) is from 1 μm to 50 μm, preferably from 1 μm to 40 μm and very particularly preferably from 1 μm to 15 μm. (Determined to DIN EN ISO 4287 and 4288.)

[0020] This micro-roughness is achieved by way of example via steps in the production process. If the plastics mouldings are produced via the known processes of cast polymerization, it is achieved via roughness of the glass plates used to form the polymerization cell, and if the plastics mouldings are produced via extrusion it is achieved via addition of diffuser beads, for example those described in DE 43 27 464.

[0021] The roughness of the surface can also be achieved via fillers, such as a granulated material composed of mineral substances.

[0022] The inventive plastics moulding therefore has two types of roughness:

[0023] firstly the raised structures whose height is from 500 μm to 20 μm, and whose separation is from 500 μm to 6000 μm, the number of the raised structures being from 1 to 500/cm^2, and

[0024] micro-roughness of from 1 μm to 50 μm, preferably from 1 μm to 40 μm and very particularly preferably from 1 μm to 15 μm.

[0025] The micro-roughness continues across the raised structure.

The material is marketed as Textured PLEXIGLAS® Swing by Röhm GmbH & Co. KG, and is used in the fitting-out of interiors and of exhibition stands, and, for example, for balcony parapets, wind-screening, glazing in garage doors or in other doors, roofing over entrances, partitions, staircase parapets, shower compartment dividers, shelves, cabinet doors, advertising displays, incidental tables, glazed walls and cloakrooms.

[0026] By virtue of the inventive solution, the entire surface of the sanitary element, in particular edges and curves, can be rendered antislip, and this applies particularly to flat shower trays.

WORKING OF THE INVENTION

[0027] The Textured PLEXIGLAS® sheet was installed in an apparatus to DIN 51097 and tested.

[0028] By virtue of the inventive solution, the sanitary element has no zones that do not have antislip properties. The antislip sheet can be composed of one layer, of two layers (FIG. **1**) or else of a plurality of layers. Multilayer sanitary elements can be produced via coextrusion of the corresponding moulding compositions.

[0029] Reinforcing layers that can be used are any of the reinforcing layers known in the construction of sanitary elements.

RESULTS

[0030]

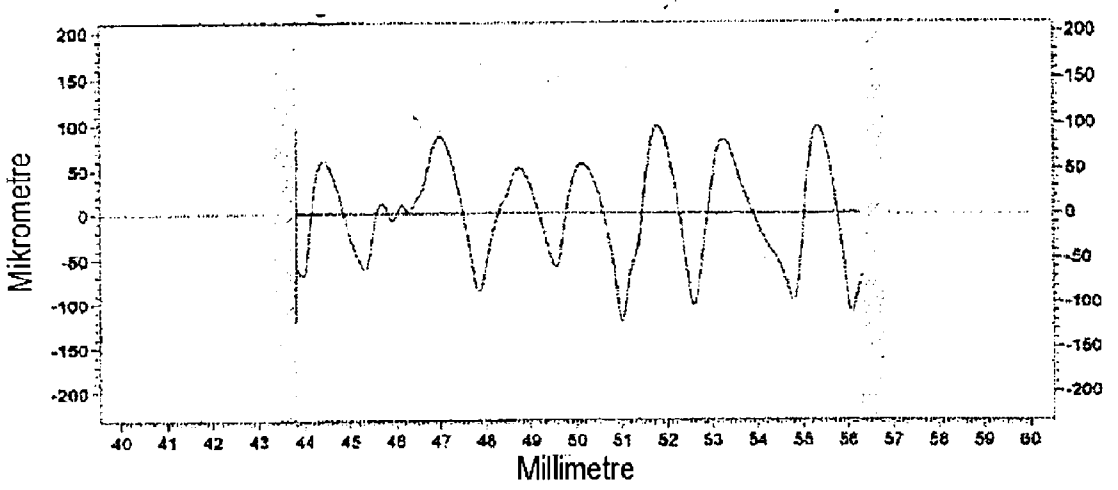
Textured PLEXIGLAS ® sheet	Angle (°)
Crimp (CL)	5
Pearl	5
WW086 SF (SF = skin friendly)	6
Pluto	6
WBF99SW (SW = Swing)	12/test certificate No. 67160404.001

[0031] The Textured PLEXIGLAS® product with Swing surface achieves classification A to DIN 51097.

[0032] The height of the structures of Textured PLEXIGLAS® with Swing surface is about 58 μm, and their separation is from 3 to 8 mm, these being arabesque-like structures (FIG. **2**).

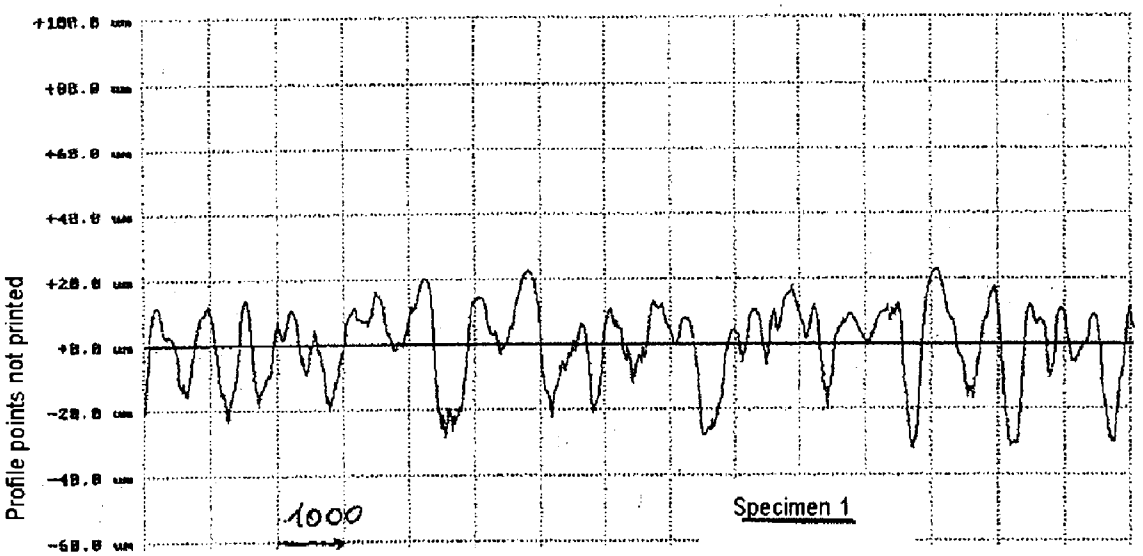
EXAMPLE 1

[0033] Measurement of a Merely Structured Surface


Mikrometre
200
150
100
50
0
-50
-100
-150
-200
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Millimetre

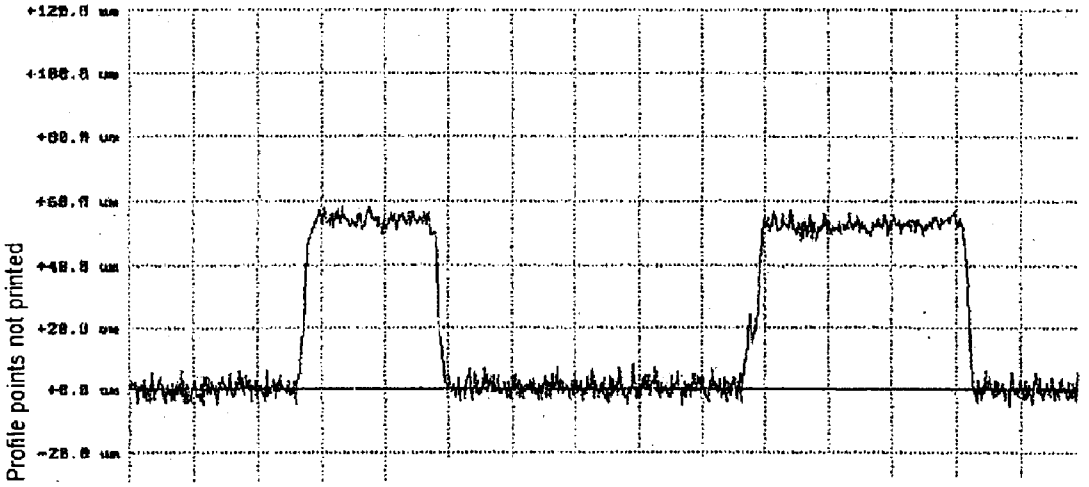
EXAMPLE 2

[0034] Measurement of a Merely Micro-Rough Surface


+100.0 um
+80.0 um
+60.0 um
+40.0 um
+20.0 um
+0.0 um
-20.0 um
-40.0 um
-60.0 um
Profile points not printed
1000
Specimen 1

EXAMPLE 3

[0035] Measurement of the Inventive Surface


Profile points not printed

1. Use of plastics mouldings with structured and micro-rough surfaces as antislip floor covering in barefoot areas affected by wet conditions.

2. Antislip floor covering for barefoot areas affected by wet conditions,

characterized in that

it is composed of a plastics moulding with structured and micro-rough surfaces.

3. Sanitary element,

characterized in that

it has an antislip floor covering according to claim **2**.

4. Use according to claim **1**,

characterized in that

the plastics moulding is composed of poly(meth)-acrylate.

5. Use according to claim **4**,

characterized in that

the plastics moulding is composed of at least one layer composed of poly(meth)acrylate.

6. Use of plastics mouldings according to claim **4** as antislip covering for sanitary elements,

characterized in that

raised structures have been arranged at the surface of the plastics moulding, the separation of the structures being from 500 μm to 6000 μm, the amount of the raised structures being from 1 to 500/cm^2, and the height of the raised structures being from 20 μm to 500 μm, and the micro-roughness being from 1 μm to 50 μm.

7. Use of plastics mouldings according to claim **6** as antislip covering for sanitary elements,

characterized in that

raised structures have been arranged at the surface of the plastics moulding, the separation of the structures being from 1500 μm to 4500 μm, the amount of the raised structures being from 1 to 250/cm^2, and the height of the raised structures being from 20 μm to 500 μm, and the micro-roughness of the raised structures being from 2 μm to 40 μm.

8. Use of plastics mouldings according to claim **7** as antislip covering for sanitary elements,

characterized in that

raised structures have been arranged at the surface of the plastics moulding, the separation of the structures being from 1500 μm to 4500 μm, the amount of the raised structures being from 1 to 250/cm^2, and the height of the raised structures being from 20 μm to 500 μm, and the micro-roughness of the raised structures being from 1 μm to 15 μm.

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