

IMPROVEMENTS TO FRICTION SURFACES

FIELD OF INVENTION

5 The present invention relates to a surface for providing an enhanced friction effect, and particularly to a surface having a pattern of protrusions which are engaged to enhance the frictional coupling between the surface and traffic passing over the surface. The surface protrusions typically engage the soles of footwear of pedestrian traffic or the
10 tyres of a wheeled vehicle, for example. Such enhanced friction surfaces are often provided on ground and floor plates, on vehicle or pedestrian ramps, on drain cover plates, and on covers over manholes providing underground access, for example.

BACKGROUND

15 European patent application 0 021 591 describes an anti-slip tread or grating which has a surface with a pattern of rosettes each having a several individual lobes which extend upward and inward. The lobes project high enough to bite into the soles of footwear to provide an excellent gripping surface.

20 European patent specification 0 191 486 describes an impressed non-slip floor covering surface with raised circular knobs.

European patent application 0 620 330 describes bars for gratings. Each bar has a tread surface with raised ribs. The ribs are rectilinear and are grouped in clusters.

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Japanese Patent Abstract 200045312 describes a cover having a surface with truncated conical or pyramidal protrusions. The sides of the protrusions are grooved.

30 United States Patent Application 2002/0185579 describes a plastic moulded deck board with a cargo supporting surface. One embodiment (shown in Figure 8) has conical or pyramidal protrusions of various heights.

SUMMARY OF INVENTION

The object of at least one aspect of the present invention is to provide a non-skid or anti-slip surface, or at least to provide the public with a useful choice.

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In broad terms a first aspect of the invention may be said to be a friction surface having a plurality of protrusions which extend above the general level of the surface, the protrusions being grouped together in one or more clusters, each cluster including at least one longer protrusion which extends above the general level of the surface by a greater distance than at least one shorter protrusion of the same cluster.

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At least one of the protrusions may be surrounded by a plurality of the protrusions forming a row of protrusions at the periphery of the cluster.

Optionally, at least one shorter protrusion is surrounded by the peripheral row of protrusions, and the peripheral row of protrusions includes at least one longer protrusion.

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Optionally, the peripheral row includes a plurality of longer protrusions and a plurality of shorter protrusions, and a plurality of shorter protrusions is surrounded by the peripheral row.

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Optionally, the peripheral row is arranged as a rectangle, shorter protrusions are located at the four corners of the rectangular peripheral row, and longer protrusions are located between adjacent corners at intermediate positions along each side of the rectangular peripheral row.

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The surrounded shorter protrusions may be arranged in at least one rectangular pattern which surrounds a single central protrusion.

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The upper surface of at least one of the protrusions may be provided with one or more grooves.

Optionally, at least one of said protrusions has a substantially circular cross-section parallel to the general plane of the surface, and the or each groove extends diametrically across the upper surface of the protrusion.

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Optionally, the friction surface is a major face of a sheet of material, and the protrusions are formed by impressing the sheet into a first die by forcing a second die into the other major face of the sheet.

10 The invention may further be said to consist in any alternative combination of parts or features mentioned herein or shown in the accompanying drawings. Known equivalents of these parts or features which are not expressly set out are nevertheless deemed to be included.

15 BRIEF DESCRIPTION OF DRAWINGS

It will be appreciated that a friction surface having non-skid or anti-slip properties may be implemented in various forms. Preferred embodiments of the invention will now be described, by way of example only and without intending to be limiting, with reference
20 to the accompanying drawings of which:

Figure 1 shows a plan view of a pattern of protrusions on a fragment of a sheet having a friction surface according to the current invention,

Figure 2 shows a plan view of a single protrusion on a sheet having a friction surface as shown in Figure 1,

25 Figure 3 shows a cross-sectional elevation of a short protrusion, as seen at line X-X' of Figure 2, and

Figure 4 shows a cross-sectional elevation of a long protrusion, as seen at line X-X' of Figure 2.

30 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In this description, various features are referred to by relative positions or orientations; for example, by terms such as "upper", "above", "topside", "lower" and "underside".

These and similar references are given to aid in the understanding of the invention when the friction surface is an upper surface of a generally horizontal sheet as shown in the figures. The invention may be conveniently used in this orientation, i.e. with the friction surface about horizontal. However, the invention is not limited to this particular orientation.

Figure 1 shows a pattern of protrusions 1 in an upper surface 2 of a sheet 3. The protrusions may be moulded or pressed in the sheet which may be a metal, for example steel, stainless steel, aluminium or an aluminium alloy.

The protrusions 1 extend above the general level of the upper surface 2 of the sheet 3, as may be best appreciated from the cross-sectional elevations of Figures 3 and 4. The protrusions of each cluster have various heights: i.e. longer protrusions 1L extend above the general level of the upper surface 2 of the sheet 3 by a greater distance than shorter protrusions 1S. The upper cluster shown in Figure 1 is labelled to show a preferred arrangement of the different height protrusions 1L, 1S. In this embodiment the arrangement is repeated in the other clusters on the friction surface.

Figure 3 shows a cross-sectional elevation of a shorter protrusion 1S as seen at line X-X' of Figure 2 when Figure 2 is the plan view of a shorter protrusion. Figure 4 shows a cross-sectional elevation of a longer protrusion 1L as seen at line X-X' of Figure 2 when Figure 2 is the plan view of a longer protrusion.

The protrusions 1 are preferably formed by forcing a male die (not shown) against the underside of the sheet 3 to impress the topside or upper surface 2 into a female die (not shown) shaped with cavities corresponding to the protrusions to be formed.

The protrusions are preferably circular and provided with a grooved upper surface, as shown in the plan view of a single protrusion shown in Figure 2. The upper surface of the protrusion slopes down toward a depressed central zone 4 and has a pair of diametrical grooves 5. The grooves have a V-shaped cross-section, each groove having a pair of generally flat flanks. The upper edges of the flanks provide a circular array of

gripping zones by which the protrusions can frictionally engage an object supported by the friction surface. In particular, the radially-outer portions 6 of the upper edges of the flanks extend above the remainder of the protrusion to provide salient points for the frictional engagement, as may be best appreciated from the cross-sectional views of Figures 3 and 4. The range of different angular alignments of the edges of the flanks (best appreciated from the plan view of Figure 2) provides for effective frictional engagement with an object moving in any direction across the friction surface.

The protrusions are grouped in clusters, as seen in the plan view of the sheet shown in Figure 1. The clusters are preferably regularly spaced in a repeating pattern across the upper surface of the sheet, as indicated by the fragment of the pattern seen in Figure 1.

Each cluster has one or more inner protrusions surrounded by an outer peripheral row of protrusions. In the pattern of the preferred embodiment shown in Figure 1, five shorter protrusions are arranged as a single central protrusion surrounded by a rectangular pattern of four protrusions. These five shorter protrusions are, in turn, surrounded by a rectangular outer peripheral row of protrusions. A shorter protrusion is located at each of the four corners of the rectangular peripheral row. A longer protrusion is located at each of the four sides of the rectangular row, intermediate the corner protrusions.

In the preferred embodiment the sheet 3 is a metal sheet and is about 3.5 mm thick. The height of the salient points 6 above the general surface 2 of the sheet 3 is about 2.2 mm in the shorter protrusions and about 2.5 mm in the longer protrusions. The depressed central zone is about 1.2 mm below the salient points in each case. Each depression 7 at the underside of the sheet is co-axial with a corresponding protrusion. The overall diameter at the base of each protrusion is about 9.8 mm and the depressions have a diameter of about 6.4 mm. The depressions under the shorter protrusions are about 3.3 mm deep and those under the longer protrusions are about 3.6 mm deep. The walls of the protrusions and depressions are angled at about 10 degrees from perpendicular, as may be best appreciated from the cross-sectional views of Figures 3 and 4, to allow easy release of the formed sheet from the dies.

The friction surface described above is used as a non-slip or non-skid or anti-slip tread or floor surface, and is preferably provided as protrusions impressed or moulded into a sheet material.

- 5 The foregoing describes the invention including preferred forms thereof. Alterations and modifications as will be obvious to those skilled in the art are intended to be incorporated within the scope of the invention as defined in the accompanying claims.

10 It is to be understood that the numerical references included in parentheses in the following claims are given merely as a guide in understanding the correspondence between integers of the claims and the features of the exemplary but non-limiting embodiments shown in the figures. The claims are not intended to be limited to the features or arrangements as shown in the figures.

List of features labelled in the drawings:

protrusions 1 (longer protrusions 1L, shorter protrusions 1S)

upper surface 2

5 sheet 3

central zone 4

grooves 5

salient points 6

CLAIMS:

1 A friction surface (2) having a plurality of protrusions (1) which extend above the
general level of the surface, the protrusions being grouped together in one or more
5 clusters, each cluster including at least one longer protrusion (1L) which extends above
the general level of the surface by a greater distance than at least one shorter
protrusion (1S) of the same cluster.

2 A friction surface as claimed in claimed 1, wherein at least one of said protrusions
10 is surrounded by a plurality of said protrusions forming a row of protrusions at the
periphery of the cluster.

3 A friction surface as claimed in claim 2, wherein at least one shorter protrusion is
surrounded by the peripheral row of protrusions, and the peripheral row of protrusions
15 includes at least one longer protrusion.

4 A friction surface as claimed in claim 3, wherein the peripheral row includes a
plurality of longer protrusions and a plurality of shorter protrusions, and a plurality of
shorter protrusions is surrounded by the peripheral row.

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5 A friction surface as claimed in claim 4, wherein the peripheral row is arranged as
a rectangle, shorter protrusions are located at the four corners of the rectangular
peripheral row, and longer protrusions are located between adjacent corners at
intermediate positions along each side of the rectangular peripheral row.

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6 A friction surface as claimed in claim 5, wherein the surrounded shorter
protrusions are arranged in at least one rectangular pattern which surrounds a single
central protrusion.

30 7 A friction surface as claimed in any one of the preceding claims, wherein the
upper surface of at least one of said protrusions is provided with one or more
grooves (5).

8 A friction surface as claimed in claim 7, wherein at least one of said protrusions has a substantially circular cross-section parallel to the general plane of the surface, and the or each groove extends diametrically across the upper surface of the protrusion.

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9 A friction surface as claimed in claim 8, wherein the friction surface is a major face of a sheet of material, and the protrusions are formed by impressing the sheet into a first die by forcing a second die into the other major face of the sheet.