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A road retexturing apparatus (100) for retexturing a road surface which includes an aggregate has a plurality of rotors (300), each including a plurality of substantially parallel shafts (4) substantially evenly radially spaced from a central axis (5). Rotor rotating means (11) are provided for rotating each of the rotors (300) about the central axis (5). Each shaft (4) is provided with a plurality of spaced apart cutting tools (6), each of which is provided with a plurality of teeth (7). The cutting tools (6) are rotatably mounted to the shaft (4) such that they are able to move transverse to a longitudinal axis of the shaft (4) wherein, in use, rotation of the rotors (300) causes the teeth (7) of the cutting tools (6) to impact on the road surface, fracture the aggregate, and then bounce off the road surface.
AUSTRALIA
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COMPLETE SPECIFICATION
INNOVATION PATENT

Applicant: RICHARD JOHN LANE

Invention Title: ROAD RETEXTURING APPARATUS

The following statement is a full description of this invention, including the best method of performing it known to me/us:
ROAD RETEXTURING APPARATUS

The present invention relates to methods and apparatus for retexturing road surfaces, and in particular, but not exclusively, to methods and apparatus for retexturing roads having an upper layer including an exposed aggregate.

BACKGROUND ART

So called "chip seal" roads have a working surface which comprises crushed stone chips or "aggregate" held in a bituminous matrix. The aggregate typically has a diameter of around 10mm to 20 mm.

The crushing process creates stone chips which have sharp edges, thereby creating a surface which provides good traction to road vehicles using the road. However, over time the sharp edges wear down, and the traction provided by the road is degraded.

It would be advantageous to provide a road retexturing machine and/or a method of retexturing a road surface which could at least partially restore the traction properties of such a road surface.

Road surfaces are often undulating, and so it would be advantageous if the road retexturing machine could follow the undulations as closely as possible.

It would be advantageous if at least preferred embodiments of the present invention provided a road retexturing apparatus and/or a method of retexturing a road which could overcome and/or ameliorate problems with such apparatus and methods at present, or to at least provide a useful choice.

Other advantages of the present invention may become apparent from the following description, which is given by way of example only.
SUMMARY OF THE INVENTION

According to one aspect of the present invention there is provided a road retexturing apparatus for retexturing a road surface having an upper layer including an aggregate, the apparatus including:

- a plurality of rotors, each said rotor including a plurality of substantially parallel shafts substantially evenly radially spaced from a central axis;
- rotor rotating means for rotating each said rotor about the central axis;
- each said shaft provided with a plurality of spaced apart cutting tools, each of which is provided with a plurality of teeth, the cutting tools rotatably mounted to the shaft such that they are able to move transverse to a longitudinal axis of the shaft wherein, in use, rotation of the rotors causes the teeth of the cutting tools to impact on the road surface, fracture the aggregate, and then bounce off the road surface.

Preferably, the rotors are arranged in at least two rows, and each said row contains at least 5 rotors.

Preferably, each said rotor is held at a predetermined distance from the upper layer of the road, and the predetermined distance is adjustable.

Preferably, spacing means are provided to hold each said cutting tool a minimum distance apart from an adjacent said cutting tool, wherein the minimum distance is less than an average diameter of said aggregate.

According to a second aspect of the present invention there is provided a road retexturing apparatus substantially as herein described with reference to the accompanying figures.

Further aspects of the invention, which should be considered in all its novel aspects, will become apparent from the following description given by way of example of possible embodiments of the invention.
BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1  Is a diagrammatic plan view of a road retexturing apparatus according to one preferred embodiment of the present invention.

Figure 2  Is a side elevation of the apparatus of Figure 1.

Figure 3  Is an enlarged side elevation of the right rear bogie of the apparatus of Figure 1.

Figure 4  Is a diagrammatic front view of a preferred rotor, with the rotor shafts shown in hidden detail.

Figure 5  Is a plan view of a preferred cutting tool.

BRIEF DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Referring first to Figures 1 to 3, a road retexturing apparatus according to one possible embodiment of the present invention is generally referenced 100.

The apparatus includes a plurality of bogies, generally referenced 200, attached to a frame 1. Each bogie 200 is provided with at least one leading wheel 2 and at least one trailing wheel 3. Each bogie is provided with a rotor, generally referenced 300.

Referring next to Figures 3 and 4, each rotor 300 includes a plurality of substantially parallel shafts 4 substantially evenly spaced apart around a central axis of rotation 5.

Each rotor 300 is preferably around 200mm wide. In some embodiments (not shown) each bogie 200 may be provided with more than one rotor 300, but it is preferred that there is only one rotor 300 per bogie 200 so that the surface of the road is followed more closely.
Each shaft 4 is provided with a plurality of substantially disc shaped cutting tools 6, each of which is provided with a plurality of teeth 7, as shown in Figure 5. In a preferred embodiment the cutting tools 6 are substantially pentagonal in shape, with a tungsten carbide tooth 7 provided at each vertex 8. In a particularly preferred embodiment the rotor 300 and cutting tools 6 may be substantially identical to those used in some concrete scabblers of the prior art, for example those produced by the Swiss company Von Arx AG.

While the term "cutting tool" has been used, those skilled in the art will appreciate that, as is described further below, the action of the tool on the road is a fracturing or smashing action, rather than a true cutting action.

Referring next to Figures 4 and 5, the cutting tools 6 are mounted to the shaft 4 by means of a mounting aperture 9 through which the shaft 4 extends. The mounting aperture 9 has a diameter significantly greater than the diameter than the shaft 4. This means that the cutting tool 6 is able to move or "float" in a direction transverse to the longitudinal axis of the shaft 4. In a preferred embodiment the enlarged mounting aperture allows around 10mm of transverse movement.

Referring next to Figures 2, 4 and 5, in use the frame 1 is towed behind a suitable tractor vehicle (not shown). The frame 1 is provided with wheels 10, which are preferably mounted in a self aligning or castored arrangement. Typically the apparatus is towed at very low speed, for example around 2-3 kph.

A rotor rotating means such as a hydraulic motor 11 rotates each rotor 300, preferably at around 2500 rpm. The height of the rotors 300 is set so that the cutting tools 6 can make contact with the upper layer of the road (not shown) when at the lowest point of rotation. The contact is achieved using the movement or "float" allowed by the large mounting apertures 9, so that the cutting tools 6 are not driven or forced into the road by the mounting shafts 4. In a preferred embodiment each bogie 200 is provided with its own rotor rotating means.

The rotors 300 rotate in the same direction as the direction of travel of the apparatus 100, so that the cutting tools 6 are moving in substantially the same direction as the road, relative to the frame 1. This is important, as rotating the rotors 300 in the opposite direction, so that the cutting tools 6 were moving in substantially the opposite
direction to the road relative to the frame, could cause the aggregate to be pulled out of the upper surface of the road. The rotors 300 are preferably substantially parallel to the road surface when in use.

The teeth 7 of the cutting tools 6 impact on the aggregate (not shown) in the upper layer of the road, fracturing the aggregate and thereby creating a more angular surface. Once the cutting tool 6 has impacted on the aggregate it bounces upward, using the movement allowed by the oversized mounting aperture 9, and is moved away from the road surface by the rotation of the rotor 300. The rotation of the rotor 300 then moves the next set of teeth 6 into contact with the road surface.

In a preferred embodiment the points of the teeth 7 on each cutting tool 6 are on a notional circle having a diameter of approximately 40mm, and each cutting tool 6 is approximately 6mm wide. The spacing between adjacent cutting tools 6 is preferably selected so that teeth 7 on two adjacent tools 6 can impact on the same piece of aggregate (not shown), that is the spacing is less than the average diameter of the aggregate. In a preferred embodiment spacers 12 of around 2-3mm thickness are provided between each cutting tool 6, although the cutting tools 6 are preferably loosely packed onto the shaft 4 so that they are able to move slightly further apart if necessary.

In a preferred embodiment each rotor 300 has four parallel shafts 4 spaced approximately 60mm apart.

Referring next to Figure 3, the height of the rotor 300 relative to the bogie wheels 2, 3 is preferably variable. In the embodiment shown the rear wheel 3 is mounted to a pivoting arm 13 and can be lowered or raised relative to the rotor 300.

Each bogie 200 is preferably slidably and rotatably attached to the frame 1, preferably by a pin 14 which is slideably and rotatably engaged with a substantially vertical slot 15 in the frame 1, allowing the bogie 200 to move up and down or "float" relative to the frame 1, and to pitch as it moves over undulations in the road.

Referring back to Figure 1, the bogies 200 and rotors 300 are arranged in two overlapping rows, although in some embodiments three or more overlapping rows of bogies and rotors may be used. The rotors are preferably orientated substantially...
orthogonal to the direction of travel of the apparatus. In a preferred embodiment the two overlapping rows contain ten rotors 300, and the apparatus 100 is able to resurface an entire lane width with two passes. If greater compliance with the road is required then the rotor width may be reduced and a greater number of rotors 300 may be used.

Those skilled in the art will appreciate that the present invention may also be used to retexture roads such as dense graded asphalt, asphaltic concrete, SMA and porous open graded asphalt.

Where in the foregoing description, reference has been made to specific components or integers of the invention having known equivalents, then such equivalents are herein incorporated as if individually set forth.

Although this invention has been described by way of example and with reference to possible embodiments thereof, it is to be understood that modifications or improvements may be made thereto without departing from the spirit or scope thereof.
WHAT IS CLAIMED IS AS FOLLOWS:

1. A road retexturing apparatus for retexturing a road surface having an upper layer including an aggregate, the apparatus including;
   - a plurality of rotors, each said rotor including a plurality of substantially parallel shafts substantially evenly radially spaced from a central axis;
   - rotor rotating means for rotating each said rotor about the central axis;
   - each said shaft provided with a plurality of spaced apart cutting tools, each of which is provided with a plurality of teeth, the cutting tools rotatably mounted to the shaft such that they are able to move transverse to a longitudinal axis of the shaft wherein, in use, rotation of the rotors causes the teeth of the cutting tools to impact on the road surface, fracture the aggregate, and then bounce off the road surface.

2. The apparatus of claim 1, wherein the rotors are arranged in at least two rows, and each said row contains at least 5 rotors.

3. The apparatus of claim 1 or 2 wherein each said rotor is held at a predetermined distance from the upper layer of the road, and the predetermined distance is adjustable.

4. The apparatus of claims 1, 2 or 3 wherein spacing means are provided to hold each said cutting tool a minimum distance apart from an adjacent said cutting tool, wherein the minimum distance is less than an average diameter of said aggregate.

5. A road retexturing apparatus substantially as herein described with reference to the accompanying figures.
FIGURE 4

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