A method to repair a portion of a PCC sidewalk that has been damaged due to changes in an underlying support surface. The method includes removing a portion of the PCC sidewalk that is damaged and replacing the damaged portion with a piece of solid, yet flexible, material. The material is fitted to and installed in a volume established by the removal of the damaged portions of the PCC sidewalk.
PORTLAND CEMENT CONCRETE SIDEWALK REPAIR METHOD

CROSS REFERENCES AND RELATED SUBJECT MATTER


BACKGROUND OF THE INVENTION

The invention relates to methods for repairing damaged portions of Portland Cement Concrete sidewalks. More particularly, the present invention provides methods for repairing portions of sidewalks that are damaged due to bucking and heaving caused by, for example, the roots of trees, as well as other known causes.

The placement of trees and shrubs at the edge of, or proximal to, Portland cement walkways is a common practice. The classic ‘tree lined avenue’ is one common example. Alternately, Portland cement concrete sidewalks or driveways may be paved with nearby trees and shrubs left intact. Often, as the trees and or bushes grow, their roots exert outward and upward forces upon the under side of these Portland Cement Concrete sidewalks, and typically result in lifting, cracking, heaving, separating and or buckling. Municipalities employ workers to repair damaged roads, sidewalks, and the like. This typically results in activities in which the workers remove a portion of the damaged Portland Cement Concrete sidewalks, and place a ‘patch’ into a volume established by the removing of the damaged portion. The patch is usually formed by material that is matched to expansion and contraction characteristics, as well as the general appearance and texture of the removed portion of the Portland Cement Concrete surface. However, this method of repair does not yield a long term solution. As the roots continue to grow, it is very common for the patch (applied to repair the damaged portion of the Portland Cement Concrete surface) to itself lift, crack, separate and or buckle. Accordingly, while repair methods, including patching, may be suitable for the particular purposes intended, or for a more general use, they are not suitable for the purpose contemplated for the present invention.

Objects of the present invention are, therefore, to provide new and improved methods for repairing a damaged portion of a Portland Cement Concrete sidewalk having one or more of the following capabilities, features, characteristics and or advantages:

- simple and functional method of repair;
- employs a firm or hard, yet somewhat flexible, piece of a Portland Cement Concrete sidewalk;
- the piece of material is configured and structured to enable it to give and bulge when forces are exerted thereupon, such as those caused by an increase in the size of a nearby root (due to growth over a possibly long time period);
- may employ a filling means for leveling a bottom surface of a volume established by the removal of the damaged portion of the paved surface;
- may employ the firm or hard yet flexible material, preferably in a sheet form having a substantially uniform thickness;
- may employ a composition or mixture that may be poured into the volume to form the piece of material;
- edges of the piece of material fitted into the volume may be fixed to adjacent and abutting vertical wall surfaces of the Portland Cement Concrete sidewalk;
- the fixing of the edges of the piece of material may be provided by employing a means including suitable glues and or caulking compounds; and
- a simple and economical method practiced with primarily off-the-shelf materials and tools.

The above listed objects, advantages, and associated novel features of the present invention, as well as others, will become more clear with a careful review of the description and figures provided herein. Attention is called to the fact, however, that the drawings and the associated description are illustrated only, and variations are certainly possible.

SUMMARY OF THE INVENTION

In accordance with the present invention, a method to repair a damaged portion of a Portland Cement Concrete sidewalk is provided that is especially useful when the damage is caused by the growth of tree roots, and the like. The method includes removing a portion of the Portland Cement Concrete (PCC) sidewalk that is damaged and to be repaired. The removing of the damaged portions of the PCC sidewalk substantially forms a volume that must be filled. To fill the volume at least, one piece of solid, yet flexible material is installed into the volume. The piece of material is fitted, possibly by trimming, to fill the volume to restore the damaged portion of the sidewalk to substantially an original height. The method may further include the step of tamping and substantially leveling a bottom surface area, established by the volume, before installing the piece of material therein.

In a preferred embodiment the piece of material is provided having a fixed uniform thickness and is mat-like in shape. The piece of material, in such an embodiment, may be best described as a ‘dense rubberized material’. The rubberized characteristic is necessary to enable the piece of material, which would typically be glued or otherwise fixed in place, to expand and lift. For example, if a nearby root expanded through growth and exerted an upward force upon the piece of material, it would cause it to bulge or lift. Although in a preferred embodiment of the present invention a ‘cured’ piece of material is employed for the fitting and installation into the volume formed by the removal of the damaged portion, the piece of material may be the removal of the damaged portion, the piece of material may be provided and formed by a rubberized composite mixture that may be poured into and fill the volume (and then cure). Regardless of the specific form or type of material used, the goal is to restore the sidewalk surface to substantially its original height with a solid, yet flexible material that will not easily crack and sustain damage due to heaving, lifting, cracking, separating, and/or buckling.
BRIEF DESCRIPTION OF THE DRAWINGS

[0019] In the drawings, like elements are assigned like reference numerals. The drawings are not necessarily to scale, with the emphasis instead placed upon the principles of the present invention. The drawings are briefly described as follows:

[0020] FIG. 1 provides a perspective view of an undamaged portion of a PCC sidewalk.

[0021] FIG. 2 depicts a portion of a PCC sidewalk that had been damaged by roots of a nearby tree.

[0022] FIG. 3 illustrates a perspective view of a volume that has been established, at least in part, by the removal of the damaged portion of the PCC sidewalk.

[0023] FIG. 4 provides a view of a completed repair made to the originally damaged portion of the PCC sidewalk in accordance with the present invention.

LIST OF REFERENCE NUMERALS USED IN THE DRAWINGS

<table>
<thead>
<tr>
<th>Reference Numeral</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>a portion of a PCC sidewalk</td>
</tr>
<tr>
<td>10a</td>
<td>sections of the portion of the PCC sidewalk</td>
</tr>
<tr>
<td>10b</td>
<td>side walls of the PCC sidewalk</td>
</tr>
<tr>
<td>12</td>
<td>damaged portion of the PCC sidewalk</td>
</tr>
<tr>
<td>16</td>
<td>material, or equivalently ‘the piece of material’</td>
</tr>
<tr>
<td>18</td>
<td>volume</td>
</tr>
<tr>
<td>20</td>
<td>tree (or the like)</td>
</tr>
<tr>
<td>22</td>
<td>glue</td>
</tr>
<tr>
<td>24</td>
<td>glued edge</td>
</tr>
<tr>
<td>26</td>
<td>filler</td>
</tr>
</tbody>
</table>

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] To ensure clarity in the description of the present invention, it is necessary to establish the definition of a number of important terms and expressions that will be used throughout this disclosure. The expression ‘repair by replacement’ is to indicate that a portion, possibly formed by one or more sections, or partial sections, and substantially replacing the removed portions with a material suitable for use with the method of the present invention. Importantly, the terms ‘a dense rubberized material’ and ‘the piece of material’ are to be considered equivalents within the context of this disclosure. Other terms and expressions will be defined as needed.

[0025] Referring to FIG. 1, there can be seen therein a portion of PCC sidewalk 10 that is undamaged. The PCC sidewalk 10 may be formed of discrete sections 10a, which are illustrated without any underlying support surface shown for clarity. As is common with many PCC sidewalks, such as PCC sidewalk 10, a tree, such as the tree 20, may be planted in close proximity to form a root system, which is not illustrated. Root systems of tree 20 will generally include surface roots that extend approximately horizontally, as well as deep reaching roots, which are essentially vertically oriented.

[0026] As can be seen in FIG. 2, a PCC sidewalk 10 may be damaged over time as the tree 20 grows and its surface roots, etc., cause uplifting of one or more sections 10a composing a part of the PCC sidewalk 10. Sufficient uplifting will cause at least one of cracking, lifting, heaving, buckling, etc., to one or more sections 10a. Since the surface roots are essential to support and feed the tree 20, cutting and removing them when effecting a repair is undesirable. The method of repair of the present invention is especially useful for repairing a damaged portion 12 of the PCC sidewalk 10 as shown in FIG. 2.

[0027] A method provided by the present invention effects a repair to the damaged portion 12 of the PCC sidewalk 10 employing a ‘repair by replacement’ approach. First, a portion of the PCC sidewalk 10 that has been damaged, say due to changes in an underlying support surface (or surfaces), is removed. The removal of the damaged portion(s) 12, as well as any other sections 10a to be replaced, will substantially form a volume 18. The volume 18, which can be clearly seen in FIG. 3, is to be suitably filled with a piece of solid, yet flexible material 16. Again, it must be understood that the expressions ‘a piece of material’, ‘a piece of solid, yet flexible material’, and ‘the material’ will be used interchangeably.

[0028] In a preferred embodiment of the invention, the material 16 may be provided as any dense rubberized material that may enable, for example, bulging and lifting while not separating from adjacent walls including side walls 10b of adjacent and abutting sections of the PCC sidewalk 10. Accordingly, the material 16 may be one monolithic piece of a rubberized very firm material having a sheet-like or mat-like shape, that preferably would be provided in a thick, fixed thickness form. It is contemplated that the material 16, when provided in a sheet form, may be cut and trimmed to provide a suitable and snug fit when installed within the volume 18. It is further contemplated that in a most preferred embodiment of the present invention the side walls (formed by a height of the material 16) would be fixed to at least one vertical side wall of one or more unremoved sections 10a of the PCC sidewalk 10. That is, side walls or edges of the material 16 may be suitably fixed to the side walls 10b. The side walls 10b directly abut the material 16. A glue 22, as shown in FIG. 4, provides an embodiment of a “glue means”. Others would certainly be well known to skilled persons. For example, a number of available caulking substances, or epoxy type glues, may be utilized.

[0029] The method of the present invention includes the careful installing into the volume 18 of at least one piece of material 16, possibly provided as a piece of solid, flexible material which may be fitted to fill and fully accommodate the volume 18. The desired result is to restore a damaged portion 12 of PCC sidewalk to substantially an original height. The material 16 will preferably be sufficiently flexible to withstand any reasonable lifting and settling that may occur without being damaged. In this context ‘without being damaged’ is intended to indicate that the section will not buckle, crack, separate, etc.

[0030] It is important to understand that the material 16 may alternatively be provided by a rubberized composite that is poured into the volume 16. A sufficient amount of the material 16 would be poured (into the volume) to restore the damaged region or area being repaired to substantially an original height. The composite material may then cure (via setting, cooling, drying, or the like).

[0031] Regardless of the manner in which the volume is filled and repaired using the material 16, the material, or at
least the surface thereof, may be configured in a bright color. The bright color may serve to clearly indicate and warn persons approaching the material 16 that the portion of PCC sidewalk 10 therein may be bulged and may not represent a substantially flattened smooth surface. As such, the bright color may be employed to indicate to approaching individuals that it may be necessary to slow down and proceed with caution.

As skilled persons will appreciate, once the portions of the PCC sidewalk 10 have been removed the leveling and tamping down of a bottom surface area established by the volume 16 is advisable. A flattened and uniform depth is most preferable when employing the sheet-like (or mat-like) version of material 16. However, the presence of roots from the tree 20 may prevent the establishment of a desired and sufficiently flattened surface. In such cases it may be desirable to employ a filling means, such as filler 26 shown in FIG. 4, to build up the bottom surface area and provide a suitably flattened surface. Alternatively, the embodiment of the material 16 that is a suitable composite or mixture may be utilized.

It is important to understand that the above description of the embodiments of the methods of the present invention are exemplary only, and other equivalent steps are certainly possible. For example, skilled persons will realize that it may be desirable or advantageous to refill a portion of the volume 16 that has resulted from the removal of damaged and other sections of the paved surface 10 with one or more sections formed of the rigid material (such as that used to form the other sections 16a) in addition to the flexible piece of material 16. Therefore, while there have been described the currently preferred embodiments of the methods of the invention, those skilled in the art will recognize that other and further modifications may be made without departing from the present invention, and it is intended to claim all modifications and variations as fall within the scope of the appended claims.

What is claimed is:

1. A method to repair a damaged portion of a PCC sidewalk, the method comprising the steps of:

   (a) removing a portion of the PCC sidewalk that is damaged and to be repaired by replacement, the removing of the portion of the PCC sidewalk substantially forming a volume; and

   (b) installing into the volume at least one piece of solid, yet flexible material, the piece of material fitted to fill the volume and restore the damaged portion of the PCC sidewalk to substantially an original height.

2. The method according to claim 1, further including the step of tamping and substantially leveling a bottom surface area established by the volume before installing the piece of material.

3. The method according to claim 1, wherein the piece of material is provided having a fixed uniform thickness and is mat-like in shape.

4. The method according to claim 3, wherein a filling means may be placed over the bottom surface area, for leveling purposes, prior to installation of the piece of material, thereby resulting in filling the volume in part by the filling means and in part by the piece of material.

5. The method according to claim 1, wherein the piece of material is provided and formed by a rubberized composite mixture that may be poured into and fill the volume to restore the sidewalk to substantially an original height.

6. The method according to claim 1, wherein the piece of material is provided in a bright color to indicate and warn nearby persons that a portion of the sidewalk, which now contains the piece of material thereat, may not be substantially or entirely flat.

7. A method wherein a damaged portion of PCC sidewalk is repaired by replacement, the method comprising the steps of:

   (a) establishing a volume by removing the damaged portion of the sidewalk to be repaired by replacement;

   (b) at least one of tamping and leveling a bottom surface area formed by the volume, and

   (c) installing within the volume at least one piece of dense rubberized material sized to have a snug fit within the volume, and restore an area that included the damaged portion of sidewalk to substantially an original height.

8. The method according to claim 7, wherein the dense rubberized material is provided as a thick fixed thickness sheet material that may be cut and trimmed to provide the snug fit when installed within the volume.

9. The method according to claim 8, wherein at least one side wall of the dense rubberized material is fixed to at least one vertical side wall portion of an adjacent portion of PCC sidewalk with the side walls of the dense rubberized material and the vertical side walls of adjacent portions of the sidewalk abutting each other.

10. The method according to claim 9, wherein at least one side wall of the dense rubberized material and at least one vertical side wall of the PCC sidewalk that are abutting are fixed and joined by employing glue means therebetween.