ABSTRACT: I disclose a paving block comprising a plurality of cleat members disclosed in a spaced array, a number of buttressing members engaging said cleat members to reinforce the same, said buttressing members defining openings extending through the thickness of said paving block.
PAVING BLOCK AND PAVING FORMED THEREWITH

This application is a continuation-in-part of my copending application entitled "Precast Concrete Paving Block and Paving Formed Therewith," filed Dec. 13, 1966, Ser. No. 601,512 and now abandoned.

The present invention relates to a precast paving block made from concrete or other cementitious material or from a structural material, such as aluminum or its alloys, steel, or certain types of plastics, and more particularly to a precasting block which can be laid in conjunction with a plurality of such blocks to form a parking area, driveway, or other paved area which not only possesses considerable load-bearing capability but is pleasing in appearance.

The paving block of the invention is particularly adapted for forming a paved area which comprises tow or more surface materials in order to create various aesthetic effects. These effects may partially or completely conceal the load-bearing surfaces of the paving or may take the form of aesthetic patterns in which the load-bearing surfaces constitute a more or less prominent feature. For example, the load-engaging portions of the paved area can be imparted with non-load-bearing materials of differing textures or colorations for the production of varied aesthetic patterns.

For example, a parking area formed with my paving blocks can be fitted harmoniously into grass and other landscaped areas of parks, playgrounds and educational or research institutions without the usual unesthetic appearance of very large expanses of conventional asphalt, gravel, or cinder parking lots. This can be accomplished by virtue of the fact that the major portion of my novel paved area thus formed can be a non-load-bearing material such as soil and sod or grass interspersed with the load-engaging surfaces of my paving blocks area, with the result that the grass largely conceals the existence of the parking or other paved area or permits the load-bearing surfaces to show as a regular, pleasing pattern, as desired. On the other hand, the aforementioned load-engaging surfaces prevent the application of loads to the soil or sod areas so that the grass continues to grow substantially unimpeded although frequent use is made of the paved area.

Besides the aforementioned applications, my paving blocks can be used in the shoulder areas of highways and other areas to provide grassy areas extending to the edges of the highway in keeping with the modern trend in landscaped highway construction. The paving blocks protect the grassy portions of the shoulder from load-bearing contact with vehicular traffic, and at the same time, and more importantly provide a paved area at the edge of the primary road paving to prevent the development of ruts, drops, etc., which are exceedingly dangerous to high-speed vehicle operation.

In previous arrangements of paving areas constructed from paving blocks, the blocks have usually taken the shape of relatively flat squares or other suitable shape, laid edge to edge to form a substantially continuous paved area. Such paved areas have been used almost entirely for pedestrian walks, patios, porches and the like, as the thinness of the paving blocks prevent their use for heavy loads such as parking vehicles. Moreover, each of the paving blocks of this type are substantially continuous so that the paved area formed thereby presents the appearance of a continuous, paved area rather than a lawn area wherein the load-bearing paving material is largely concealed. Conventional paving blocks of this configuration are difficult to lay in place without leaving narrow gaps therebetween which permit random growth of grass and other vegetation to detract further from the appearance of the patio or other paved area.

A modification of these prior arrangements is disclosed in Rice U.S. Pat. No. 2,662,343 wherein widely spaced apertures are formed in thin, flat paving blocks to provide for a limited amount of plant growth. While this arrangement may diminish the stark appearance of the substantially continuous paved area, it fails to obscure in any significant way the paving material.

Another attempt to solve this problem is illustrated by Notari U.S. Pat. No. 2,210,150 which discloses an apparently sturdier paving block. Here again the sod or grassy portion of an area paved with Notari paving blocks comprise a rather small proportion of the total paving area and therefore interrupts the stark appearance of a continuously concreted or paved area by a not much greater degree than in the aforementioned Rice patent. The Notari paved area would be about 80 percent exposed concrete. Moreover, the use of opposingly slanted surfaces in the Notari paving block would render this block practically impossible to remove from a mold structure.

The Notari paving block moreover is extremely heavy with respect to the paving area occupied by a single block. An inordinate amount of labor and material, therefore, is required to construct a paved area from the Notari blocks. Owing to lack of adequate buttressing, certain portions of the Notari block would fail quickly by reason of shear stresses developed therein upon the application of loads to the paved area.

The paving blocks of Schraudenbach U.S. Pat. Nos. 3,301,148 and 3,343,468 do not present a uniform, design appearance and more importantly, do not furnish the same load-bearing characteristic in every direction of the blocks. The Schraudenbach blocks, moreover, do not provide adequate moisture for the growth of grass or other vegetation between the load-bearing projections thereof.

Many of these conventional paving blocks are not furnished with adequate spacing means to facilitate laying the blocks in a prescribed pattern to prevent shifting or separation of the paving blocks. Conventional blocks do not afford sufficient surface engagement with the supporting subsoil, particularly at the areas of greatest load application.

I overcome these disadvantages of the prior art by providing a paving block having a number of spaced load-engaging projections or cleats which are buttressed and shaped for maximum load-carrying capability with minimum weight. The configuration of the paving block is such that the preponderant portion thereof can be placed below the surface of the parking area, driveway, or lawn in which is used. The load-engaging surfaces of the aforementioned cleats aggregate a minor proportion of the total surface area of the driveway, parking area or lawn in which the paving blocks are embedded. In the specific embodiments of my invention as illustrated herein the exposed surfaces of the paving blocks comprising a given paved area constitute only about one-fourth of that area. The remainder of the area can be filled in with sod or grass or other aesthetic material, which is protected by the exposed cleat surfaces of the paving blocks. Thus, from a distance at least, the paved area can give the appearance of a continuous lawn or other landscaped area.

The weight-reducing openings provided in each of the paving blocks prevents the blocks from heaving as a result of frost or freezing in the colder climates. The thickness of the paving blocks permits construction of the paved area contemplated by the invention even in relatively wet areas. In furtherance of this purpose the paving blocks can be closely spaced to permit portions of the paved area to yield without cracking and without separation of the blocks. Those portions of my novel blocks to which maximum loads are applied are shaped for maximum surface contact with the subsoil or other support on which the blocks are laid. The paving blocks of my invention provide a novel paved area of substantial thickness and weight-carrying capacity without the use of extremely heavy paving blocks and in consequence without the use of inordinate amounts of labor and materials. Laying of the paving blocks in assisted through use of a novel spacing lug arrangement.

I accomplish these desirable results by providing a paving block comprising a plurality of cleat members disclosed in a
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spaced array, a number of buttressing members engaging said cleat members to reinforce the same, said buttressing members defining openings extending through the thickness of said paving block. The buttressing members define a plurality of recesses or depressions below the load-bearing surfaces of said cleats, said grooves and said openings being capable of containing aesthetic material in surrounding relation to each of said surfaces. In other applications of my invention a plurality of said paving blocks are laid adjacently to form a paved area, and nonload-bearing material is placed over said buttressing members and into said openings to produce an aesthetic pattern of said nonload-bearing material and the load-bearing surfaces of said cleats. In a specific example of my invention the aforementioned nonload-bearing material is soil and grass.

I, therefore, desire to provide a paving block comprising a plurality of cleat members disclosed in a spaced array, a number of buttressing members engaging said cleat members to reinforce the same, said buttressing members defining openings extending through the thickness of said paving block.

I also desirably provide a similar paving block wherein said cleats are erect and truncated pyramids.

I also desirably provide a similar paving block wherein said buttressing members are of reduced width relative to those cleat portions joined thereto to define correspondingly larger openings.

I also desirably provide a similar paving block wherein said truncated pyramids are truncated pentahedrons and said larger openings are cruciform in configuration.

During the foregoing discussion, various objects, features and advantages of the invention have been set forth. These and other objects, features and advantages of the invention together with structural details thereof will be elaborated upon during the forthcoming description of certain presently preferred embodiments of the invention and certain presently preferred methods of practicing the same.

In the accompanying drawings I have shown certain presently preferred embodiments of the invention and have illustrated certain presently preferred methods of practicing the same, wherein:

FIG. 1 is a top isometric view of one form of paving block arranged in accordance with my invention;

FIG. 2 is a bottom isometric view of the paving block as shown in FIG. 1;

FIG. 3 is a front elevational view of the paving block as shown in FIG. 1;

FIG. 4 is a right side elevational view of the paving block as shown in FIG. 1;

FIG. 5 is a rear elevational view of the paving block of FIG. 1;

FIG. 6 is a top isometric view of another form of my novel paving block;

FIG. 7 is a bottom isometric view of the paving block as shown in FIG. 6;

FIG. 8 is a front elevational view of the paving block as shown in FIG. 6;

FIG. 9 is a right side elevational view of the paving block shown in FIG. 6;

FIG. 9A is a rear elevational view of the paving block shown in FIG. 6;

FIG. 10 is an isometric view of still another form of the paving block of my invention;

FIG. 11 is a top plan view of the paving block as shown in FIG. 10;

FIG. 12 is a cross-sectional view of the paving block as shown in FIG. 11 and taken along reference line XII-XII thereof. FIG. 12 also illustrates an abutting relationship between adjacent paving blocks; and

FIG. 13 is a fragmentary reduced isometric view of a novel paved area constructed from any of the aforementioned forms of my novel paving block.

Referring now more particularly to that form of my paving block as shown in FIGS. 1-5 of the drawings, the paving block 10 of my invention comprises a concrete or other cementitious or building material structure having in this example a substantially rectangular or square configuration in plan as indicated in FIGS. 1 and 2. The paving block 10 is provided with spacing lugs 12 and 14 respectively along two adjoining sides. Thus, those paving blocks such as the paving block 10a will usually have lugs 12 and 14 on two sides thereof as indicated by the solid lug outlines (FIG. 6), although some or all of these can be omitted depending upon the position of the paving blocks in the paved area of FIG. 14.

Each paving block 10 is provided with a plurality of buttressed load-bearing projections or cleats 22, the height of which is equal to the maximum thickness of the paving block 10. In this arrangement each cleat 22 is connected to adjacent cleats by a buttressing member 24 which is of reduced height and width relative to the cleats 22. The use of the reduced buttressing portions 24 imparts a pier-like load-bearing capability to each of the cleats 22 so that the aggregate load-bearing capability of the cleats 22 of a given paving block is almost the same as if the block 10 were made from solid concrete. Thus, the reduced buttressing members 24 reduce the weight of the connecting portions 24 and hence of the entire paving block 10, and at the same time provide spaces for the insertion of aesthetic material, for example for soil and sod in order to preserve the appearance of a lawn or landscaped area.

Interspersed in a regular array among buttressing members 24 are a plurality of openings 26 extending vertically through the paving block 10. As better shown in FIG. 1, the openings 26 result in the elimination of heavy cementitious material from the paving block 10, which material is not required to stabilize or buttress the cleats 22, since the eliminated material, i.e., that displaced by the openings 26 would not greatly add to the lateral support afforded by the buttressing members 24, which desirably are reinforced, by rods or wires mesh 27 (FIG. 2). The openings 26 include lateral recesses 28, as better shown in FIG. 2, and therefore are defined by the reduced areas of members 24. Therefore, use of the through openings 26 further reduces the weight of the paving block 10 without deleteriously affecting the load-bearing capability thereof. The openings also provide additional spaces for the use of the aforementioned aesthetic materials, such as asphalt or colored concrete or the like, or soil and sod for the growth of grass or other plant life. The presence of the reduced buttressing portions 24 do not materially affect the supply of moisture (by capillary action) through openings 26 and their recesses 28, to plant life growing directly over the buttresses 26. Moreover, the presence of the through openings 26 affords drainage for the paved areas as a whole and also affords a supply of moisture for any grass or other vegetation surrounding the cleats 22 from the ground below during dryer periods.

With the configuration of my paving blocks as shown in FIGS. 1-5 it will be seen that the exposed surfaces 30 of the cleats 22 constitute only a minor percentage of the area occupied by the paving block 10 including the lugs 12 and 14 on two sides thereof as shown in FIG. 1. Therefore if it is desired to largely conceal a parking area, driveway, or the like, the openings 26 and the reduced buttressing portions 24 can be filled with soil and sod or planted-in grass which will project above the cleats surface 30 with the result that at least from a distance the paved area 16 will have the appearance of a continuous lawn area. Alternatively, the exposed cleat surfaces 30 can serve as a pleasing but subdued geometric or checkered pattern in a lawn or other landscaped area as better shown in FIG. 13.

Referring now to FIGS. 6-9A of the drawings, another form 32 of my novel paving block is illustrated therefor. The paving block 32 is likewise provided with a plurality of cleats 22', reduced buttressing portions 24' and through openings 26' having recesses 28', so as to form a cruciform opening configuration, as better shown in FIG. 7. The paving block 32 in this example is likewise generally square in plan and is generally the same overall size as the block 10 of FIGS. 1-5.

The cleats 22', being arranged in rows of four in this example,
are therefore correspondingly smaller in plan, although approximately of the same height as required by anticipated loadings. As explained hereinafter in connection with FIGS. 10—12, the cleats 22' of FIGS. 6—9A and the cleats 22 of FIGS. 1—5 are pier-shaped or generally of truncated pyramid configuration for maximum load-carrying ability for a given mass and weight. This shape also maximizes the contact areas of bottom surfaces 43 of the cleats 22' relative to the subsoil or other support. Naturally, a different number and size of cleats 22 or 22' can be employed rather than as shown, depending upon the application of the invention. For similar reasons the sides of the reduced buttressing portions 24 or 24' are tapered downwardly and outwardly.

Two sides are desirably provided with a plurality of spacing lugs 34 and 36 respectively. The spacing lugs 34 and 36 are better shown in FIG. 7 and afford a means for exactly spacing the paving blocks from adjacent paving blocks so that the regular array of cleats 22' is preserved throughout the paved area. The reinforcing rods or wires desirably extend into the spacing lugs 34 and 36 as denoted by reference characters 38 to provide a maximum support or buttressing action for the associated cleats 22'. The openings 26—28' between the cleats 22' and depressions 29 over the buttresses 24', and the areas over the spacing lugs 34, 36 can be filled or covered with the various types of aesthetic materials including soil and grass as noted previously. If desired, some of the buttressing members 24' can be provided with vertical holes 41 (FIG. 7) through which steel pins (not shown) or the like can be driven to secure the blocks against lateral displacement.

Referring now to FIGS. 10—12 of the drawings, still another form 40 of my novel paving block is illustrated therein. The overall configuration of the paving block is illustrated therein. The overall configuration of the paving block 40 including its spacing lugs 42 and 44 is generally similar to that described above with reference to the preceding FIGS. of the disclosure wherein the cleats 22' is likewise in the form of a truncated pyramid such as a pentahedron. Although a rectangular pyramid is shown, other forms of truncated pyramids can be employed depending upon the desired shape of exposed cleat surfaces 36'. The cleats 22' are interconnected by a number of buttressing portions 24', equal in width to that of the adjacent portions of the cleats 22 as shown in this example. Flat interstices in a regular array among buttressing portions 24' are a plurality of generally rectangular openings through openings 26'. The sidewalks 48 of the buttresses 24' are tapered downwardly and outwardly thereof as better shown in FIG. 12 so that the openings 26' are smaller at the underside of the paving block 40 than at the top surfaces 46 of the buttress 24'. By the same token, the undersurfaces of the paving block 40 present a corresponding greater area of soil contact for better support in softer soils.

In a specific example of the invention it is contemplated that the angles of inclination of the cleat sidewalks 50 and the aforementioned buttress sidewalks 48 and of the spacing lug sidewalks 52 be substantially identical to facilitate removal of a mold structure (not shown) from the paving block 40. As noted previously the inclined sidewalks 48, 50 and 52 provide the necessary structural reinforcement of the buttresses 24', cleats 22' and lugs 42, 44 respectively. The cleats 22' are additionally reinforced by the buttresses 24'. When forming a paved area from a plurality of paving blocks 40 the spacing lugs for example the lugs 44 are disposed in abutting relationship with the nonlugged edge of an adjacent paving block.

As viewed in FIG. 11 it will be seen that all of the cleats 22' and part of the buttressing members 24' are arranged in vertical-spaced rows as denoted by arrows 54 while the cleats 22' and the remainder of the buttressing members 24' are arranged in transverse or horizontal rows as denoted by arrows 56. Similar rows of cleats and buttressing members are employed in the paving blocks 10 and 32 shown previously. One or more reinforcing rods or wires 58 or 60 are embedded in each of the rows 54 and 56 respectively, generally at the elevation shown in FIG. 12. Alternatively a heavy-duty road mesh or other wide mesh wire can be employed instead of the reinforcing rods or wires 58—60. The adjacent end portions of the rods or wires can be extended into the spacing lugs 42—44 to reinforce the latter. Similar reinforcing rods or wires can be provided in the paving blocks 10 and 32. In order to receive the rod or wire ends the spacing lugs 42, 44 are extensions of the respective rows 54 and 56. A similar spatial relationship is employed in connection with the spacing lugs 34 and 36 of FIGS. 6—9 and the spacing lugs 12, 14 of FIGS. 1—5.

A concrete- and grass-paved area 62 formed from any of the types of paving blocks disclosed herein and their equivalents is illustrated in FIG. 13 of the drawings. As evident from FIG. 13 the paving block is substantially fully embedded within the soil or other base material and the cleats 22 thereof can project only a minor distance above grade to prevent the application of loads to the grass, sod and soil surrounding the cleats 22. Even where the paving blocks 10, 32 or 40 are laid such that their cleat surfaces 30 are substantially flush with the soil or sod or other grande material the relatively close spacing between adjacent ones of the cleats 22 prevents any substantial application of loads to such aesthetic material. In the case of a concrete- and grass-paved area such as illustrated in FIG. 13 the grass 64 can be trimmed at variable heights above the cleat surfaces 30 depending upon the extent of concealment desired.

From the foregoing it will be apparent that novel and efficient forms of paving block and paving formed therewith have been described herein. While I have shown and described certain presently preferred embodiments of the invention and have illustrated presently preferred methods of practicing the same, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

1. A paving block comprising a plurality of load-bearing cleat members disposed in a spaced array in substantially parallel rows, a number of buttressing members joined at their ends to said cleat members respectively to reinforce the same, said cleat members having top surfaces substantially coplanar and projecting above said buttressing members, and adjacent ones of said cleat members and said buttressing members defining respective openings extending through the thickness of said paving block, the bottom surfaces of said cleat members and said buttressing members being substantially coplanar, the top surfaces of said buttressing members being substantially coplanar in a plane spaced below and substantially parallel to said cleat member top surfaces, the sides of said cleat and said buttressing members being substantially plane surfaces.

2. The combination according to claim 1 wherein spacing lugs are provided along lateral edges of said block, said lugs being similar in shape to said buttressing members.

3. The combination according to claim 1 wherein a plurality of said paving blocks are laid adjacently to form a paved area, nonload-bearing material is placed over said buttressing members and into said openings to produce an aesthetic pattern of said nonload-bearing material and the load-bearing surfaces of said cleats, and said buttressing members and said cleat members are disposed relative to one another to form a symmetrical pattern of said nonload-bearing material and said cleat surfaces.

4. The combination according to claim 3 wherein said nonload-bearing material includes soil and grass.

5. The combination according to claim 1 wherein a reinforcing wire mesh is embedded in said row, said through openings being in registry with openings of said mesh, the wires of said mesh having points of crossing registering respectively with said cleat members.

6. A paving block comprising a plurality of load-bearing cleat members disposed in a spaced array, a number of buttressing members joined at their ends to said cleat members respectively to reinforce the same, said cleat members projecting above said buttressing members, and adjacent ones of
said cleat members and said buttressing members defining
openings extending through the thickness of said paving
block, the bottom surfaces of said cleat members and said but-
trressing members being substantially coplanar, the top sur-
faces of said buttressing members being substantially
coplanar, said cleat members being erect and truncated
pyramids.

7. A paving block comprising a plurality of cleat members
disposed in a spaced array, a number of buttressing members
joined at their ends to said cleat members respectively to rein-
force the same, said buttressing members defining openings
extending through the thickness of said paving block, said cleats being in the shape of erect and truncated pyramids, said
buttressing members having upper flat surfaces extending
between adjacent cleat members and having sidewalls inclined
downwardly and outwardly, and at least the adjacent portions
of said cleat members being similarly inclined.

8. The combination according to claim 7 wherein the cleat
sidewalls and the buttressing sidewalls have the same angle of
inclination.

9. The combination according to claim 7 wherein said but-
trressing members are of reduced width relative to those cleat
portions joined thereto to define correspondingly larger
through openings.

10. The combination according to claim 9 wherein said
larger openings are cruciform in configuration.

11. A paving block comprising a plurality of load-bearing
cleat members disposed in a spaced array and in substantially
parallel rows, a number of buttressing members joined at their
ends to said cleat members respectively to reinforce the same,
said cleat members projecting above said buttressing mem-
bers, adjacent ones of said buttressing members substantially
defining respective openings extending through the thickness
of said paving block, said buttressing members being of
reduced width relative to the adjacent portions of said cleat
members at their junctions with said buttressing members,
said cleat members being in the shape of truncated pyramids
respectively having rectangular bases and plane faces extend-
ing from the top to the bottom of said block.

12. A paving block comprising a plurality of cleat members
disposed in a spaced array, a number of buttressing members
joined at their ends to said cleat members respectively to rein-
force the same, said buttressing members defining openings
extending through the thickness of said paving block, said
cleats being in the shape of truncated pyramids, said but-
tressing members having upper flat surfaces extending
between adjacent cleat members and having inclined
sidewalls, and at least the adjacent portions of said cleat mem-
bers being similarly inclined.