A modular decking system includes decking in the form of a plurality of treads, the decking being supported by one or more beams, each beam having a lower surface. The modular decking system also includes a plurality of piers, each pier having an upper surface and each pier supporting on that upper surface an end of one or more beams, and a grid engagement system. The grid engagement system is capable of aligning and engaging the upper surface of a pier with the lower surface of the end of any beam supported thereon in a manner that prevents substantial lateral movement of the beam relative to the pier.
MODULAR DECKING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This patent application claims priority to Australian provisional patent application 2,006,904,889, the specification of which is hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a modular decking system of the type that may be used for domestic decking or light commercial decking.

BACKGROUND OF THE INVENTION

[0003] Raised outside decks are common in many homes. They are usually built using a timber or metal supporting frame and substructure to which timber boards or plastic boards are secured with fasteners such as nails or screws. Many such decks are subject to severe climatic conditions that can result in warping, splitting, twisting, and cracking of the boards and partial drawing and rusting of the fasteners. Apart from being unsightly, this also represents a safety hazard and requires regular maintenance. Timber can also be difficult to maintain as a non-slip surface.

[0004] Many existing decks are also complex and time-consuming to build in situ, often requiring trade-level skills (such as carpentry) and power tools in their construction, and possibly chemical use where timber requires protection. Substantive material wastage also often occurs when fitting the decks to specific sites.

[0005] The use of pre-cast, modular, concrete components allows for a long-life deck that can be installed quickly and easily by a home handyman. The use of colored concrete and non-slip surfaces provides an attractive and safe surface that requires little or no maintenance. The combined weight of the components once they are interlocked provides structural integrity without the use of nails or screws. Such decks can be installed directly onto the ground without the need for inground footings in many projects.

[0006] Examples of such systems are exemplified in our co-pending U.S. Pat. No. 5,906,084 and our co-pending Australian patent application 2,006,903,432. However, the systems described therein are better suited for larger scale commercial installations, rather than for typically simpler and less complex domestic installations.

[0007] It is an aim of the present invention to provide a modular decking system which is reasonably simple to install, such as by a home handyman, and which provides for installation flexibility.

SUMMARY OF THE INVENTION

[0009] The present invention provides a modular decking system that includes:

[0010] decking in the form of a plurality of treads, the decking being supported by one or more beams, each beam having a lower surface;

[0011] a plurality of pier, each pier having an upper surface and each pier supporting on that upper surface an end of one or more beams; and

[0012] a grip engagement system; wherein the grid engagement system is capable of aligning and engaging the upper surface of a pier with the lower surface of the end of any beam supported thereon in a manner that prevents substantial lateral movement of the beam relative to the pier.

[0013] The grid engagement system of the present invention is preferably provided by the interaction of male and female members. In one form, the male members may be provided by one of the upper surface of a pier or the lower surface of a beam, with the female members then being provided by the other of the upper surface of a pier or the lower surface of a beam. In this respect, while provision of female members will, by definition, require a formation of some sort within the relevant surface, it should be appreciated that this need not be the case for the male members. Indeed, male members may be provided either by being integrally formed within or as a part of a relevant surface, or may alternatively be formed by an arrangement of separate parts that interact with that surface to thereby form the male members.

[0014] In one form, the male members can be provided by a network of parallel and perpendicular ribs provided in the upper or lower surface of the pier or beam respectively, and the female members can be provided by one or more correspondingly shaped grooves provided in the other of the lower or upper surfaces respectively. Ideally, the male members will be provided by the upper surface of the pier and the female members will be provided by the lower surface of the beam.

[0015] In a preferred form, the upper surface of a pier includes a series of elongate straight ribs, the series including (for most piers) at least two parallel ribs and at least two perpendicular ribs. Such a series of ribs then produce a “grid” of ribs. However, it will of course be appreciated that while many piers in a decking system may ideally be of this type, there will be some piers in any given installation that are not required to include two parallel ribs and two perpendicular ribs, but may only require a single such rib in order to meet its particular requirements (for its particular location and use), such as a pier that might be along the edge of a decking system. Therefore, it should be appreciated that not every pier in a decking system that utilizes the present invention will include such a series of ribs.

[0016] Returning to the embodiment where the upper surface of a pier includes at least two parallel ribs and at least two perpendicular ribs, the lower surface of a beam, possibly only at the ends thereof, ideally then includes a single groove therein that extends laterally across the full width of the underside of the beam. It can thus be seen that the end of the beam can then be placed down upon the pier such that
the groove of the beam receives and locates upon at least a part of one of the ribs in the upper surface of the pier. While this type of engagement will not prevent the beam from being raised vertically up off the pier, it will prevent substantial lateral movement of the beam (relative to the pier) in at least one lateral direction if it is urged horizontally. In this respect, "lateral movement" means movement in any horizontal direction, normally being a direction that is generally across the upper surface of a pier. Ideally, movement in any of these directions will be restrained, although it is envisaged that some assistance in preventing all lateral movement may be provided by the interlocking between a number of beams located upon a pier by virtue of the grid engagement system. Also, it should be appreciated that it may not be necessary for all piers utilised in a modular decking system in accordance with the present invention, to engage with all beams in this manner.

[0017] In relation to this reference to "substantial" lateral movement, it will also be appreciated that it is preferred for there to be some tolerance in the sizing of the respective male and female members and thus, in the form just mentioned, in the sizing of the respective ribs and grooves. For engineering and manufacturing purposes, any requirement for precision in sizing will introduce unnecessary complexity and cost. Also, during installation, it is generally not possible to work within small (or no) tolerances due to the likelihood of surfaces and adjacent buildings not being perfectly smooth, level, upright or square. This is particularly so where it is envisaged that the home handyman will be a major user of the modular decking system of the present invention, in a domestic environment.

[0018] In the preferred form where the male members are ribs, the ribs may be integral with the pier, may be secured to the pier, or (as mentioned above) may be formed by separate parts interacting with formations on the pier. For example, the ribs may be integral with the pier and may thus be molded as a part of the upper surface when the pier is itself formed. Alternatively, the ribs may be separate parts such as elongate rods secured to the pier such as by being glued or (plastic) welded thereto, or such as by being secured thereto by an interference fit of some sort, or by alternative fastening members such as being dowelled or secured by screws or nails. The ribs could also be provided by forming a groove in the upper surface of a pier and by then seating an elongate rod of the same length as the groove in the groove. Such a rod might be sized so as to fit tightly in the groove, and therefore not be able to move in the groove, or may be sized to have a diameter slightly smaller than the groove so as to be somewhat loose therein.

[0019] Where the female members are grooves, it is envisaged that generally semi-circular grooves will usually suffice, although any cross-sectional configuration of a groove (and thus of the corresponding male member) may of course readily be adopted.

[0020] In a further preferred form of the present invention, a decking engagement system is provided between the decking and the beams. Ideally, this will also be provided by interaction between male and female members, referred to in this instance as secondary male members and secondary female members. In one form, a secondary male member will be provided by the upper surface of each beam and one or more secondary female members will be provided by the lower surface of each tread, at both ends thereof to intercept the fixed beam locations, to therefore fix the tread locations. The secondary male member will be a single rib of a matched form that extends along the full length of the upper surface of each beam. This rib is preferably sized and shaped so as to engage with a secondary female member of a tread, such as a correspondingly sized and shaped groove that extends across the full lateral width of one end of a tread.

[0021] Furthermore, it may also be desirable to provide some type of coupling mechanism between treads to assist in providing the decking with overall stability and an integrated function. Thus, each tread of the present invention may include opposed coupling members in the form of tongue and groove coupling members capable of, in use, coupling with correspondingly shaped groove and tongue coupling members in an adjacent tread.

[0022] The tongue and groove coupling members may be located at either end of a tread and may alternate from one side to the other side, such that one side does not include both forms of coupling member. However, the tongue and groove coupling members can be arranged such that, for instance, two tongues are provided on one side of a tread and two grooves are provided on the other side of that tread. It is also possible that one tread will be provided with only tongues arranged on both sides, for engagement with an adjacent tread that may have only grooves arranged on both its sides.

[0023] Preferably, each pier, beam and tread will be formed so as to be symmetric, and in the case of the beams and treads, formed so as to be laterally symmetric about their longitudinal axis, such that the piers, beams and treads become multidirectional. In this form, a beam is able to be laid onto a pier (and a tread onto a beam) without concern about whether they are oriented correctly with respect to their opposing edges. This further allows for the minimization of manufacturing costs, as only one shape needs to be formed for each component, and also for ease of installation as the beams and treads do not need to be correctly oriented (other than having their lower surfaces facing downwardly) before being laid on a pier or beam respectively.

[0024] With particular reference to the piers, it will be appreciated that these may be formed in a variety of different shapes and thus may often be given a variety of different labels. For example, various types of traditional building elements may be used as piers, and may thus include or incorporate the male or female members mentioned above that form part of the grid engagement system, those building elements being such as precast pavers, precast concrete blocks, precast concrete pipes, in-situ concrete footings, pre-existing footings and foundations, brick columns and pavers, timber rounds/posts, and metal posts (such as with a welded top plate), and the like.

[0025] Preferably, each of the components of a modular decking system formed in accordance with the present invention will be made of concrete. Concrete is a material that is not subject to rapid deterioration as a result of rotting, corrosion or erosion, or termite attack. Additionally, and as will be apparent from the following description, the weight of concrete members is often of assistance with the various aligning and engaging requirements utilised in modular decking systems of this type. In particular, it can be seen that by providing the beams in a material such as concrete, the
dead weight of the beams assists in ensuring adequate engagement of the beams with the piers, and likewise, when fully constructed as an integrated system, the tread member's weight above is also engaged. Additionally, the treads are engaged laterally by the presence of the preferred tongue and groove coupling members.

Furthermore, it should be noted that concrete provides additional advantages in that the topside of the treads may easily be provided with textures in order to improve the aesthetics of the decking system, or for instance in order to improve the slip resistance of the tread surface. Additionally, concrete readily accepts colouring and thus the treads may be provided in suitable shades. Of course, while stating herein the advantages of concrete, it is to be appreciated that other suitable materials are not to be precluded from use with the present invention.

The use of the grid engagement system of the present invention allows for the provision to the home handyman of a kit for the building of a decking system, the kit including suitable numbers of piers, beams and treads. By providing piers and beams capable of interacting in the manner outlined above, such as by being provided with a suitable series of male members (ribs) on the upper surface of the piers, and a suitable number of female members (grooves) arranged (and possibly spaced along) the lower surface of the ends of each beam, the home handyman is provided with a modular decking system that can be used to build decking to fit a diversity of site forms to suit site alternatives and client needs. If the treads and/or beams are made of a reasonably heavy material, it will not generally be necessary to use fasteners, as the weight of the treads and/or beams (together with the engagement described above) will hold the different elements in place.

Furthermore, the presence of the grid engagement system in the modular decking system of the present invention additionally presents opportunities for interaction with other building elements that might normally be used in decking systems for domestic use. For example, mounting stirrups configured so as to be located upon and secured to the male members of a grid engagement system may be used to receive and mount upright post members to the decking system. Similar mounting stirrups may be configured that are able to receive and mount fascia members thereto. Further examples of such mounting stirrups will be described below in relation to the illustrated embodiments.

Finally, the use of a modular decking system in accordance with the present invention allows for flexibility and adjustment in the building of any such systems. The possibility of adjustment during building, which adjustment may be attended to at virtually any stage of the process, prevents the need for precise dimensions and configurations to be planned before hand. This allows for the decking system to be provided by modular components that are of uniform size and configuration, and allows for the deck to be easily adjusted for future alternative spatial use or extension without destroying connections (as in timber in situ decks)

**BRIEF DESCRIPTION OF THE DRAWINGS**

The present invention will now be described in relation to a single preferred embodiment thereof. In this respect, it is to be appreciated that the following description of the preferred embodiment does not limit in any way the generality of the above description.

In the drawings:

FIG. 1 is a perspective view of a pier for use in a first embodiment of the modular decking system of the present invention;

FIG. 2 is a perspective view of the pier of FIG. 1 in use with a beam;

FIG. 3 is a top view of the pier of FIG. 1 in use with beams;

FIG. 4 is a top view of another pier and beams, also for use with the first embodiment of the modular decking system of the present invention;

FIG. 5 is a top view of the first embodiment of the modular decking system (without decking) of the present invention, using the piers and beams of FIGS. 1, 2, 3 and 4;

FIG. 6 is a top view of the first embodiment of FIG. 5, now showing the decking in outline;

FIG. 7 is a top view of the first embodiment of FIG. 5, now showing the decking;

FIGS. 8a and 8b are views of additional building elements for use with the first embodiment of FIG. 5;

FIGS. 9a and 9b are views of additional building elements for use with the first embodiment of FIG. 5;

FIGS. 10a and 10b are a perspective view from above and a bottom view of a tread suitable for use as the decking in the first embodiment of FIG. 5.

**DETAILED DESCRIPTION OF THE DRAWINGS**

To provide the proper context for a description of the piers and beams illustrated in FIGS. 1 to 4, reference will firstly be made to the overall decking system illustrated in FIGS. 5 to 7. In FIGS. 5 to 7, there is illustrated an embodiment of a modular decking system in accordance with the present invention. FIG. 5 shows the system without decking so that the structure under the decking is visible, whereas FIG. 7 shows the system with decking. FIG. 6 includes the decking, but only in outline so that its interaction with the structure below can be appreciated.

Therefore, FIG. 5 shows a modular decking system for use in a space that is bound by walls 12 and 14, such as external walls of a domestic dwelling. The modular decking system includes decking 16 (see FIGS. 6 and 7) in the form of a plurality of treads 17. The decking 16 is supported by beams 18, 18'. In this respect, and in the embodiment illustrated in FIGS. 5 to 7, it can be seen that these beams are provided in pairs (with one series of pairs being designated by the reference numeral 18 and another series of pairs being designated by the reference numeral 18'). The role of these pair of beams 18, 18' in supporting the ends of adjacent treads 17 is apparent from FIG. 6.

The various beams 18, 18' are shown in FIG. 5 supported by a plurality of piers 20, 20' as will be better explained and illustrated in relation to FIGS. 1 to 4. Each of these piers 20, 20' has an upper surface 22 that supports thereon the lower surface 24 of one end of a beam 18, 18'. Also evident in FIGS. 5 to 7 are a series of cross-member
supports 26 included to provide additional structural support as necessary, together with fascia (or skirting) members 28 provided about the decking 16 for aesthetic purposes.

[0045] Turning now to a description of FIGS. 1 to 4, illustrated in FIGS. 1 to 3 are piers 20 suitable for use with the modular decking system 10 of the present invention. The pier 20 and a beam 18 (the beam 18 in FIG. 2 being shown being placed downwardly upon the pier 20 in the direction of arrow Z) include a grid engagement system capable of aligning and engaging the upper surface 22 of the pier 20 with the lower surface 24 of the end 30 of the beam 18, in a manner that prevents substantial lateral movement of the beam 18 relative to the pier 20. In this respect, “lateral movement” means movement in either of the directions represented by arrows X and Y in FIG. 2, being those directions that are generally across the surface 22 of the pier 20.

[0046] The grid engagement system of this embodiment is provided by the interaction of male and female members as will now be described. In this embodiment (and referring specifically to FIG. 2), the upper surface 22 of a pier 20 provides a male member 32 in the form of a network of parallel and perpendicular ribs. In this embodiment, the ribs are illustrated as a network of interconnected elongate rods having a generally rectangular cross section located within correspondingly shaped grooves formed in the surface 22 of the pier 20. It can thus be seen that the male member 32 therefore projects a grid upwardly from the surface 22 of the pier 20.

[0047] The beam 18 illustrated in FIG. 2 includes a female member in its lower surface 24, towards the end 30 thereof. The female member 34 is illustrated as a groove extending across the full lateral width of the lower surface 24 of the beam 18, shaped so as to receive therewithin a corresponding portion of the male member 32 of the pier 20. Thus, it can be seen from FIG. 2 how the beam 18 may be located upon the pier 20, to be supported thereby, with the female member 34 engaging with the male member 32 and thereby aligning and locating the beam 18 upon the pier 20. It will thus be apparent that the pier 20 may be provided in any suitable size and with any suitable spacing of the ribs of the male member 32, and that the beam 18 may be provided with a suitable width dimension and with a suitable location for the female member 34, such as to provide the type and configuration of alignment and engagement necessary to provide a modular decking system in accordance with the present invention.

[0048] Indeed, turning to a description of FIG. 3, which is a representation of one of the central piers 20 in the decking system 10 shown in FIG. 5, it can be seen how a series of beams 18, 18' can be aligned and can engage with a pier 20 by virtue of the interaction provided by the grid engagement system described above. Indeed, it can also be seen how the interlocking arrangement of the respective ends of the four beams 18, 18' acts to avoid the type of lateral movement mentioned above of the beams 18, 18' relative to the pier 20.

[0049] As is also apparent from FIG. 5, not all of the piers 20, 20' in the modular decking system 10 will receive the ends of four beams 18, 18', as is shown in FIG. 3. Indeed, the pier 20' illustrated in FIG. 4 shows a different configuration of male member 32', this male member 32' only having three ribs as is necessary for this pier 20' to be used as an external pier 20' in the decking system 10 shown in FIG. 5. Again, the nature of the interaction of beams 18, 18', together with the male member 32' of the pier 20', avoids the type of lateral movement of the beams 18, 18' mentioned above.

[0050] With reference now to the additional building elements that might be usefully added to the modular decking system 10, FIGS. 8a and 8b and FIGS. 9a and 9b illustrate the manner in which mounting stirrups 40, 50 may be used in conjunction with the grid engagement system of the present invention to provide for the mounting of additional building elements (such as the fascia 28 as shown in FIG. 5). The mounting stirrups 40, 50 are similar in that they both include a central plot receiving aperture 42, 52 within which it is possible to mount upright posts for use as, for example, hand railing or the like. Each of the mounting stirrups 40, 50 also includes fascia receiving bays 44, 54 for receiving and engaging with the ends of respective fascia panels 28.

[0051] Advantageously, each of the mounting stirrups 40, 50 are also able to include cutouts 46, 56 that are sized to receive the respective male members 32", 32" that are provided as a part of the respective piers 20", 20". In a preferred form, where the mounting stirrups 40, 50 are provided as metal members, the mounting stirrups 40, 50 may be welded to or may otherwise engage the male members 32", 32".

[0052] Finally, and in relation to FIGS. 10a and 10b, the treads 17 that form the decking 16 shown in FIGS. 6 and 7 will ideally also include a decking engaging system, similarly provided by interacting male and female members. In this respect, FIGS. 2, 3 and 4 illustrate beams 18, 18' that include on their upper surface and upwardly extending rib 60. This rib 60 provides a male member upon which a corresponding female member, in the form of a groove 62 in the bottom surface of a tread 17 is provided. By incorporating such a decking engagement system, the preferred pairing of beams 18 and 18' (as mentioned above with regard to FIGS. 5 and 6) becomes more readily apparent.

[0053] Furthermore, and also as illustrated in FIGS. 10a and 10b, the tread 17 may also include opposed coupling members in the form of tongue 64 and groove 66 coupling members capable of, in use, coupling with correspondingly shaped groove and tongue coupling members in an adjacent tread. The tongue and groove coupling members 64, 66 are shown located at either end of a tread 17 and alternate from one side to the other side, such that one side includes both a tongue coupling member 64 and a groove coupling member 66.

[0054] In conclusion, it must be appreciated that there may be other variations and modifications to the configurations described herein which are also within the scope of the present invention.

1. A modular decking system that includes:
   a. a decking in the form of a plurality of treads, the decking being supported by one or more beams, each beam having a lower surface;
   b. a plurality of piers, each having an upper surface and each pier supporting on that upper surface an end of one or more beams; and
   c. a grid engagement system;
wherein the grid engagement system is capable of aligning and engaging the upper surface of a pier with the lower surface of the end of any beam supported thereon in a manner that prevents substantial lateral movement of the beam relative to the pier.

2. A modular decking system according to claim 1, wherein the grid engagement system is provided by the interaction of male and female members.

3. A modular decking system according to claim 2, wherein the male members are provided by one of the upper surface of a pier or the lower surface of a beam, and the female members are provided by the other of the upper surface of a pier or the lower surface of a beam.

4. A modular decking system according to claim 2, wherein the male members are formed by an arrangement of separate parts that interact with either the lower surface or the upper surface to thereby form the male members.

5. A modular decking system according to claim 2, wherein the male members are provided by being integrally formed within or as a part of either the lower surface or the upper surface.

6. A modular decking system according to claim 5, wherein the male members are provided by a network of parallel and perpendicular ribs provided in the upper or lower surface of the pier or beam respectively, and the female members are provided by one or more correspondingly shaped grooves provided in the other of the lower or upper surfaces respectively.

7. A modular decking system according to claim 2, wherein the male members are provided by the upper surface of the pier and the female members are provided by the lower surface of the beam.

8. A modular decking system according to claim 1, wherein the grid engagement system is provided by the interaction of male and female members, and wherein the upper surface of a pier includes male members in the form of a series of elongate straight ribs, the series including at least two parallel ribs and at least two perpendicular ribs, and the lower surface of a beam includes a female member in the form of a single groove at each end thereof that extends laterally across the full width of the beam.

9. A modular decking system according to claim 1, wherein a decking engagement system is provided between the decking and the beams.

10. A modular decking system according to claim 9, wherein a secondary male member is provided by the upper surface of each beam and one or more secondary female members is provided by the lower surface of each tread, at both ends thereof.

11. A modular decking system according to claim 10, wherein the secondary male member is a single rib that extends along the full length of the upper surface of each beam, and the secondary female member is a correspondingly shaped groove that extends across the full lateral width of one end of a tread.

12. A modular decking system according to claim 1, further including a coupling mechanism between treads.

13. A modular decking system according to claim 12, wherein each tread includes opposed coupling members capable of, in use, coupling with correspondingly shaped coupling members in an adjacent tread.

14. A modular decking system according to claim 13, wherein the coupling members are tongue and groove coupling members.

15. A modular decking system according to claim 14, wherein the tongue and groove coupling members are located at either end of a tread and alternate from one side to the other side, such that both sides do not include the like form of coupling member.

16. A modular decking system according to claim 1, the system including one or more mounting stirrups to provide for the mounting of additional building elements to the decking system.

17. A modular decking system according to claim 16, wherein the additional building elements are fascia panels, mounting posts, fence rails, fencing and the like.

18. A modular decking system according to claim 16, wherein the mounting stirrups include central post receiving apertures within which it is possible to mount upright posts.

19. A modular decking system according to claim 16, wherein the mounting stirrups include fascia receiving bores for receiving and engaging with the ends of respective fascia panels.

20. A modular decking system according to claim 16, wherein the mounting stirrups include grid receiving apertures or openings sized to receive at least one male member provided as part of a grid engagement system, to thereby assist in maintaining the mounting stirrups in place.

21. A modular decking system according to claim 20, wherein the mounting stirrups are rigidly secured to a male member.

22. A kit of parts for assembling the modular decking system of any one of claims 1 to 21, the kit including a plurality of treads, beams and piers.