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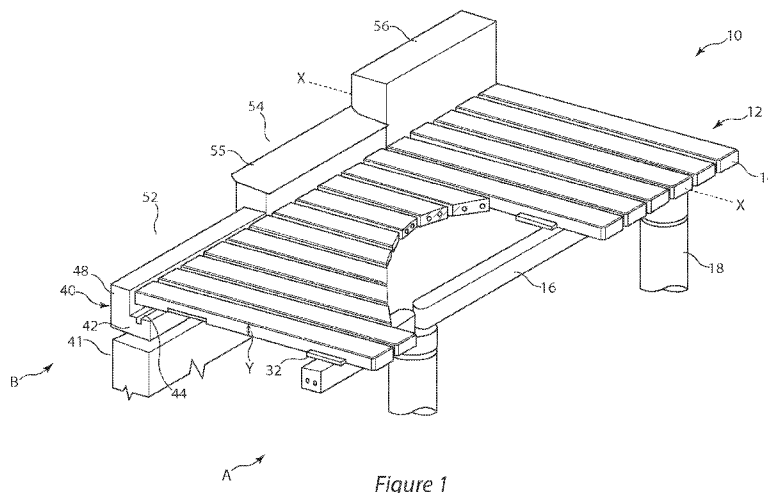


Figure 1

(57) Abstract: An abutment for use with a modular decking system that includes decking in the form of a plurality of treads, each tread being elongate and having a longitudinal axis, a topside, an underside and two ends having respective end surfaces, the underside of at least a first end of each tread including a tread coupling member. The abutment includes a tread receiving portion configured to receive the underside of the first end of each tread to thereby support the decking, the tread receiving portion including an abutment coupling member for engagement with the tread coupling member of each tread so as to prevent longitudinal movement of each received tread. The abutment also includes an upright margin configured such that the end surface of the first end of a received tread can lie closely adjacent thereto to provide a border for the decking.

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## AN ABUTMENT FOR A MODULAR DECKING SYSTEM

This international patent application claims priority from Australian provisional patent application 2007903571 filed on 2 July 2007, the contents of which are to  
5 be taken as incorporated herein by this reference.

### Field of the Invention

The present invention relates to an abutment for use in supporting the treads of a  
10 modular decking system, and thus also relates to an improved modular decking system that utilises the abutment. In this respect, the modular decking system is preferably of the type that may be used for paths, boardwalks, platforms, decking, promenades, cantilevered walkways, jetties, piers, verandahs, and small crossings such as pedestrian bridges, or the like. It is envisaged that such modular decking  
15 systems will find particular use as boardwalks through environmentally sensitive areas such as wetlands and sand dunes, or as promenades along waterfronts and the like.

### Background of the Invention

20 Most available decking systems require the use of heavy equipment for their in situ construction, and also require the preparation of substantial foundations or footings. In most situations, and certainly in environmentally sensitive situations, these requirements cause significant damage to the surrounding areas.

25 Additionally, many areas in which in situ decking systems are required are irregular in terms of terrain, and introduce design and planning difficulties where a flat surface is required over undulating features. In particular, laying paths, tracks or boardwalks through wetland areas requires careful planning and surveying of  
30 levels to ensure the various components of the path are constructed to design levels correctly, whilst even a small margin of error can cause significant construction difficulties.

In general, traditional in situ timber decking systems are subject to much error in such situations, with subsequent wastage of materials and long installation times or delays in construction.

- 5 Furthermore, many of the environments in which such decking is required are quite harsh and corrosive, and are thus environments that will rapidly deteriorate and weather-damage traditional decking materials such as timber and steel. Concrete is thus a preferred material for such environments, but its use has typically been avoided for such decking due to the difficulty of in situ construction,  
10 especially where site access is restricted due to physical or environmental reasons. Furthermore, the traditional use of steel connectors and fixing materials such as nails, screws and bolts in decking systems are similarly prone to deterioration.
- 15 Our United States patent 5,906,084 describes an improved modular decking system which overcomes, or at least partly alleviates, the abovementioned difficulties. Our co-pending international patent application PCT/AU2007/000880 (WO 2008/000021) additionally describes an improved tread and bearer member locating system for use with the modular decking system of US patent 5,906,084,  
20 which further improves and optimises the installation and inspection processes of that modular decking system and avoids the use of corrosion vulnerable fixtures and connectors.

25 However, a need has been identified for further improvement to the modular decking system, particularly in situations where it is possible (or essential) to construct the decking system so as to be in continuous contact along one of its sides with a continuous land mass. For example, in the case where the decking system is being constructed to provide a promenade along a foreshore where one side of the promenade is constructed on land and the other side is constructed  
30 over the water, an opportunity arises to use a form of continuous support for the landside of the promenade. Such a continuous support avoids the need to use stumps and bearers, which can simplify installation and can reduce the number of required components.

It is an aim of the present invention to provide an abutment for use in a modular decking system, which abutment is able to provide a useful construction alternative and additional design options for the systems described in our abovementioned patent and patent application.

5

Before turning to a summary of the present invention, it must be appreciated that the above description of the prior art has been provided merely as background to explain the context of the invention. It is not to be taken as an admission that any of the material referred to was published or known, or was a part of the common  
10 general knowledge in Australia or elsewhere.

It is also useful to provide an explanation of some of the terms that will be used to define the spatial relationship of the abutment and of the modular decking system. In this respect, spatial references throughout this specification will generally be  
15 based upon a decking that is constructed and installed so as to be generally horizontal. With this environment as the basis, the abutment and the modular decking system may then be defined with reference to the "horizontal", allowing further references to "upper" or "upwardly" and "lower" or "downwardly", and also to the "vertical".

20

Finally, some aspects of the present invention that may ultimately be claimed in isolation (and not in an in-use environment), may nonetheless be difficult to describe and understand in isolation. Thus, some of the following description does describe the invention and its embodiments in such an in-use environment (for  
25 example, an abutment in association with the treads and decking of a modular decking system).

Of course, it must be appreciated that the use of such description, and the use of the abovementioned spatial relationships, to define the present invention, is not to  
30 be seen as a limitation and certainly is not to be seen as a limitation only to the in-use environment, unless that intention is clearly stated.

### Summary of the Invention

The present invention provides an abutment for use with a modular decking system that includes decking in the form of a plurality of treads, each tread being elongate and having a longitudinal axis, a topside, an underside and two ends having respective end surfaces, the underside of at least a first end of each tread including a tread coupling member, the abutment including:

- a tread receiving portion configured to receive the underside of the first end of each tread to thereby support the decking, the tread receiving portion including an abutment coupling member for engagement with the tread coupling member of each tread so as to prevent longitudinal movement of each received tread; and
- an upright margin configured such that the end surface of the first end of a received tread can lie closely adjacent thereto to provide a border for the decking.

The present invention also provides a modular decking system that includes decking in the form of a plurality of treads, each tread being elongate and having a longitudinal axis, a topside, an underside and two ends having respective end surfaces, the underside of at least a first end of each tread including a tread coupling member, the modular decking system also including an abutment, the abutment including:

- a tread receiving portion configured to receive the underside of the first end of each tread to thereby support the decking, the tread receiving portion including an abutment coupling member for engagement with the tread coupling member of each tread so as to prevent longitudinal movement of each received tread; and
- an upright margin configured such that the end surface of the first end of a received tread can lie closely adjacent thereto to provide a border for the decking.

In a preferred form, the coupling members (being the tread coupling member and the abutment coupling member) are provided by interacting male and female

coupling members. In one form, a male coupling member may be provided by one of an upper surface of the tread receiving portion of the abutment, or by the underside of the first end of a tread, with a female member then being provided by the other of the underside of the first end of a tread or the upper surface of the tread receiving portion of the abutment. In this respect, while the provision of a female coupling member 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 a male coupling member. Indeed, a male coupling member 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 coupling member.

In one form, a male coupling member can be provided by a rib provided in the tread or abutment, and a female coupling member can be provided by a correspondingly shaped groove provided in the other of the abutment or tread respectively. Alternatively, the male coupling member can be provided by at least one locating projection extending away from the surface in which it is located, and the female coupling member is a correspondingly shaped aperture located in the opposed surface. Ideally, the male coupling member will be provided by the underside of the first end of each tread and the female coupling member will be provided by the upper surface of the tread receiving portion of the abutment.

In the most preferred form, the upper surface of the tread receiving portion of the abutment includes an elongate groove (being an abutment coupling member), which extends continuously therealong to receive in any position a downwardly extending locating projection (being a tread coupling member) formed in the underside of the first end of a tread. A series of similarly configured treads can then be easily positioned along the abutment without the need for careful and precise alignment during installation.

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With particular regard to the locating projections, preferably they will be formed integrally with the tread, and thus will be of the same material of construction as the tread. However, the locating projections may be formed separately of the

treads and then rigidly secured thereto in a suitable manner. Also, the locating projections can be of any suitable size and shape. It is envisaged that locating projections that are generally cylindrical with a diameter in the range of 15 to 50 mm, and a height in the range of 15 to 50 mm, will suffice. However, elongate  
5 ribs, also with a height in the range of 15 to 50mm will also suffice.

As mentioned above, the upright margin of the abutment of the present invention is configured such that the end surface of the first end of a received tread can lie closely adjacent thereto to provide a border for the decking. Ideally, the upright  
10 margin will extend upwardly by a distance at least equal to the thickness (or height) of the received treads, so as to form a flush upper surface therewith.

However, it is envisaged that in many forms of the invention the upright margin will extend upwardly beyond the height of the received treads and will play further  
15 functional roles in the modular decking system. Such further functional roles will now be described.

In one form, the upright margin can extend above the height of the received treads to provide a small wall or kerb (or retaining wall) as the border of the decking,  
20 upon which there may be located a seat or the like. Also, a modular fencing system or hand rail may be secured in an appropriate manner to the upright margin, again to assist with the provision of a suitable border for the decking.

In another form, the upright margin will preferably extend above the height of the  
25 received treads and will include a restraining shoulder therein capable of receiving the end of a tread therebelow to prevent substantial vertical movement (off the tread receiving portion of the abutment) of that end of the received tread. This restraining shoulder then permits the construction of a cantilevered decking (using treads with cantilever portions) in situations where that is desired or required.

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In this form, the restraining shoulder can simply be provided by a continuous cavity (such as a channel) formed in the base of the upright margin, at the location in the upright margin where (as mentioned above) the end surface of the first end of a

received tread would normally lie closely adjacent to. The continuous cavity is preferably configured to snugly receive the first end of the received tread such that substantially all vertical movement of that first end, in the cantilevered decking configuration, is prevented by the restraining shoulder thereof.

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In a preferred form, the abutment will be an integral one-piece member made of concrete. Indeed, preferably each of the components of a modular decking system formed with the abutment of 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. Additionally, the weight of concrete members is often of assistance with the various locating and connecting requirements utilised in modular decking systems of this type. In particular, it can be seen that by providing the treads in a material such as concrete, the dead weight of the treads assists in ensuring the stability of treads and the dead weight of the abutment assists in achieving other engineering solutions and designs.

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Furthermore, it should be noted that concrete provides additional advantages in that the topside of the abutment and of the treads may easily be provided with textures or (in the case of the abutments) shapes 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 abutment and 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.

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The use of a modular decking system, in conjunction with the abutment of the present invention, allows for design flexibility and adjustment in the construction of any such systems. The possibility of adjustment during construction, which adjustment may be attended to at virtually any stage of the construction process, prevents the need for precise dimensions and configurations to be planned beforehand. This allows for the decking system to be provided by modular components that are of uniform size and configuration. Additionally, by providing the

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abutments with tapered end walls, the abutments can provide curvilinear paths as will often be necessary to conform to the required directions for such decking systems.

- 5 The improved abutment reduces the number of components required for a modular decking system of the type described in our US patent 5,906,084, and thus reduces the manufacturing cost of such a modular decking system. Also, by reducing the number of components, and by providing for the easy location of the treads upon such abutments, the speed and cost of installation is reduced.
- 10 Additionally, the improved abutment can be installed as a superstructure onto seawalls, marine piles, waterfront keywalls, breakwater structures and the like.

#### Brief Description of Drawings

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

- 20 In the drawings:

Figure 1 is a schematic perspective view of a modular decking system in which the abutment of the present invention may find use;

- 25 Figure 2 is a schematic side view through section X-X of the modular decking system shown in Figure 1;

- Figures 3a and 3b are schematic side views of two alternative constructions of modular decking systems in which the abutment of the present invention may also  
30 find use;

Figures 4a and 4b are schematic side views of two further alternative constructions of modular decking systems in which the abutment of the present invention may find use, with Figure 4b showing a cantilevered decking system;

- 5 Figures 5a, 5b and 5c show preferred forms of abutment engagement systems for use with abutments of the present invention; and

Figures 6a, 6b, 6c and 6d show preferred configurations of end walls for abutments of the present invention.

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#### Detailed Description of the Drawings

Illustrated in Figure 1 is a general view of an improved modular decking system 10 constructed in accordance with an embodiment of the present invention. It will be seen from this illustration that the modular decking system 10 includes a decking 12 in the form of a plurality of treads 14 which, along one side A (in this embodiment, the water side), are carried by bearer members 16, which are in turn supported by stumps 18. The stumps 18 serve to support the bearer members 16 a suitable distance above, in this case, the water level. The modular decking system 10 may be used to construct a promenade in the form of elongate planks butted together side-by-side to form a continuous path, the other side B of the promenade being located along a foreshore or the like, such that the promenade extends out over the water away from the foreshore (as is perhaps more evident in Figure 2).

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Each tread 14 is elongate, having a longitudinal axis parallel to the section line X-X and a height indicated by arrow Y, and also having a topside 20, an underside 22, and first and second ends (24,26).

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The underside 22 of each tread 14 includes, towards its second end 26, a bearer member receiving area bound longitudinally between a pair of spaced apart, downwardly extending locating projections (28,30), and laterally between opposed coupling members in the form of tongue 32 and groove (not shown) coupling

members capable of, in use, coupling with correspondingly shaped groove and tongue coupling members in adjacent treads (this arrangement of adjacent treads being apparent from Figure 1). This combination of features at this second end 26 of each tread 14 assists in allowing for the accurate location of the treads 14 on the bearer members 16 along the water side A of the modular decking system 10.

Along the foreshore side B of the modular decking system 10 is an abutment 40 that is in accordance with an embodiment of the present invention. The abutment 40 is shown supported by suitable footings 41 as necessary. The abutment 40 includes a tread receiving portion 42 configured to receive the underside 22 of the first end 24 of each tread 14 to thereby support the decking 12. The tread receiving portion 42 is a generally flat area wide enough to receive a substantial portion of the end of each tread 14.

The tread receiving portion 42 includes an abutment coupling member 44 that is a female coupling member in the form of an elongate groove therealong, sized to be suitable for engagement with a tread coupling member (not shown in Figure 1, but referenced by numeral 46 in Figure 2) on the underside 22 of each tread 14, the engagement being such that longitudinal movement (which will typically be horizontal movement) of each received tread 14 is substantially prevented.

The tread coupling member 46 is a male coupling member in the form of a downwardly extending locating projection. In this form, the tread coupling member 46 is shown as a lug having a spherical head, the lug having a base that has been inserted into a correspondingly sized and shaped aperture in the underside 22 of the first end 24 of each tread 14. However, it will be appreciated that the tread coupling member 46 could also take the same form as one of the downwardly extending locating projections (28,30) shown as integral projections on the underside 22 of each tread 14 at the second end 26. Indeed, in the embodiments illustrated in Figures 4a and 4b (described below), the tread coupling member 47 is shown as a rib extending the full width of the underside 23 of the first end 25 of the tread 15.

The abutment 40 also includes an upright margin 48 configured such that the end surface 50 of the first end 24 of a received tread 14 can lie closely adjacent thereto to provide a border for the decking 12, as is clearly evident in Figure 1. In this respect, each tread 14 may be located such that the end surface 50 contacts the upright margin 48 or may be located to leave a small gap therebetween, such as may result from normal engineering tolerances during the manufacture of parts nonetheless intended to fit together in contact. Further, a substantial gap between the end surface 50 and the upright margin 48 may be designed into the modular decking system 10, perhaps due to the likelihood of there being ground movement in the area or perhaps for other functional or aesthetic reasons. Also, any such gap could of course be sealed after installation in any normal manner, particularly if there is a desire to reduce the likelihood of rubbish or waste gathering in the gap in an unsightly manner.

Figure 1 illustrates three different forms of border provided by the upright margin 48. The first is a simple edging 52 such as is provided by configuring the height of the upright margin 48 to be the same as the height of the decking 12. The second is a low wall 54 that has been provided with a pre-formed seat 55 thereon (as is also evident in Figure 2). The third is a higher wall 56, seen as a waist high wall in Figure 1 that may provide both an aesthetic and a physical border along the foreshore side B of the decking 12.

Before turning to a brief description of two alternative forms of modular decking system as shown in Figures 3a and 3b, it will also be apparent from Figure 2 that suitable ancillary equipment can be easily included in the modular decking system 10, such as is shown by the inclusion of the illustrated fence 60 (not present in Figure 1).

Figures 3a and 3b illustrate slight variations on the modular decking system 10 shown in Figures 1 and 2. These variations show situations where it has been possible to use the abutment 40 (shown by reference numerals 40a and 40b) on both sides of the decking 12.

Thus, in Figure 3a each tread 14 includes a tread coupling member 46a in its underside 22 at both its first 24 and second 26 ends, and each of the abutments 40a includes an upright margin 48a that provides a suitable border for the decking 12. This version of the modular decking system again includes suitable fencing 5 60a on both sides of the decking 12.

In Figure 3b, a further alternative is shown where a larger span is required and a central pillar 70 is required. In this form, although the central pillar 70 need not include the upright margin of the abutment of the present invention (as shown in 10 Figure 3b), it still includes the tread receiving portion thereof, and indeed includes two such tread receiving portions to support the ends of aligned treads 14b and 14c to form a wider continuous decking 12b. Of course, it will also be appreciated that the central pillar 70 may indeed itself also include an upright margin, centrally located and projecting from the upper surface thereof, which would then 15 advantageously be located between the adjacent ends of the aligned treads 14b and 14c.

A further alternative embodiment is illustrated in Figure 4b, with a comparative embodiment shown in Figure 4a that is very similar to the embodiment illustrated 20 in Figure 2. Illustrated in Figure 4a is a plurality of treads 15 which, along one side A' (in this embodiment, the water side), are carried by bearer members 17, which are in turn supported by stumps 19. Each tread 15 is again elongate (as outlined above), having a topside 21, an underside 23, and first and second ends (25,27).

25 Along the foreshore side B' is an abutment 43 that is in accordance with an embodiment of the present invention. The abutment 43 is shown supported by suitable footings 45 as necessary. The abutment 43 includes a tread receiving portion 49 configured to receive the underside 23 of the first end 25 of each tread 15 to thereby support the decking. The tread receiving portion 49 is a flat area 30 wide enough to receive a substantial portion of the end of each tread 15. The abutment 43 also includes an upright margin 51 configured such that the end surface 53 of the first end 25 of a received tread 15 can lie closely adjacent thereto to provide a border for the decking. As with the embodiments described above,

each tread 15 may be located such that the end surface 53 contacts the upright margin 51.

In such a structure, where reliance will be placed on the dead weight of the treads 15, and any associated parts carried by the treads 15, for their stability upon the abutment 43 and the bearers 17, the bearers 17 need to be located close enough to the second end 27 of each tread 15 so as to prevent a load on that second end pivoting about the bearers 17 to lift the first end 25 off the tread receiving portion 49. In the event that there is a desire to increase the distance that the second end 27 projects beyond the bearers 17, to provide a cantilevered tread portion FG (shown in Figure 4b), which may thus introduce an unacceptable risk of the tread 15 overturning due to a load placed at the second end 27, the abutment 43 can be provided with a tread restraining shoulder 80.

As is evident in Figure 4b, the tread restraining shoulder 80 can be provided as the upper portion of a continuous cavity 82 (or channel) that extends along the length of an abutment 43, and which is configured to snugly receive the first end 25 of a tread 15. The restraining shoulder 80 prevents any (or any substantial) movement of the first end 25 of the tread 15 in the direction of arrow M in the response to a load being placed at the second end 27 of the tread 15 and forcing that end downwardly in the direction of arrow N.

To assist with ease of location of the first end 25 into the cavity 82, the first end 25 is also shown in Figure 4b as including a bevel 84 on its lowermost edge.

Illustrated in Figures 5a, 5b and 5c are two abutments 90a and 90b, viewed in perspective in Figures 5b and 5c and from above in Figure 5a. These figures illustrate a form of abutment engagement means that could be adopted to assist in connecting one abutment to an adjacent abutment. The abutment engagement means simply includes a form of tongue and groove arrangement on opposed sides of the adjacent abutments 90a and 90b.

Finally, illustrated in Figures 6a, 6b, 6c and 6d are alternative forms of abutments 90c and 90d having tapered end walls 92 to assist with the laying of curvilinear paths (as evident in Figures 6a and 6c) as necessary. As can be seen, this may also require the use of some tapered edges or sides for some treads 96.

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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.

We claim:

1. An abutment for use with a modular decking system that includes decking in the form of a plurality of treads, each tread being elongate and having a longitudinal axis, a topside, an underside and two ends having respective end surfaces, the underside of at least a first end of each tread including a tread coupling member, the abutment including:
  - a tread receiving portion configured to receive the underside of the first end of each tread to thereby support the decking, the tread receiving portion including an abutment coupling member for engagement with the tread coupling member of each tread so as to prevent longitudinal movement of each received tread; and
  - an upright margin configured such that the end surface of the first end of a received tread can lie closely adjacent thereto to provide a border for the decking.
2. An abutment according to claim 1, wherein the coupling members are provided by interacting male and female coupling members.
3. An abutment according to claim 2, wherein a male coupling member is provided as a part of the underside of the first end of a tread.
4. An abutment according to claim 3, wherein the male coupling member is a rib or a locating projection extending away from the underside of the first end of a tread.
5. An abutment according to claim 2, wherein a female coupling member is provided as a part of an upper surface of the tread receiving portion of the abutment.
6. An abutment according to claim 5, wherein the female coupling member is a groove provided in the tread receiving portion of the abutment.

7. An abutment according to any one of claims 1 to 6, wherein the upright margin will extend upwardly by a distance at least equal to the height of the received treads.
- 5 8. An abutment according to any one of claims 1 to 6, wherein the upright margin extends beyond the height of the received treads to provide a wall as the border of the decking.
9. An abutment according to claim 8, wherein a seat is provided on the wall.
- 10 10. An abutment according to claim 8 or claim 9, wherein the abutment includes a restraining shoulder therein capable of receiving the first end of a tread therebelow to prevent substantial vertical movement (off the tread receiving portion) of that first end of the received tread.
- 15 11. An abutment according to claim 10, wherein the restraining shoulder is provided by a continuous cavity formed in the upright margin, at the location in the upright margin where the end surface of the first end of a received tread would normally lie closely adjacent to.
- 20 12. An abutment according to claim 11, wherein the continuous cavity is configured to snugly receive the first end of the received tread such that substantially all vertical movement of that first end is prevented by the restraining shoulder.
- 25 13. An abutment according to any one of claims 1 to 12 wherein abutment engagement means are provided to assist in connecting one abutment to an adjacent abutment, the abutment engagement means including a tongue and groove arrangement on opposed sides of adjacent abutments.
- 30 14. An abutment according to any one of claims 1 to 13, the abutment having tapered end walls to assist with the laying of curvilinear paths.

15. An abutment according to any one of claims 1 to 15, wherein the abutment is an integral one-piece member made of concrete.
- 5 16. An abutment according to claim 1 substantially as herein described in relation to the accompanying drawings.
- 10 17. A modular decking system that includes decking in the form of a plurality of treads, each tread being elongate and having a longitudinal axis, a topside, an underside and two ends having respective end surfaces, the underside of at least a first end of each tread including a tread coupling member, the modular decking system also including an abutment, the abutment including:
- 15 · a tread receiving portion configured to receive the underside of the first end of each tread to thereby support the decking, the tread receiving portion including an abutment coupling member for engagement with the tread coupling member of each tread so as to prevent longitudinal movement of each received tread; and
  - 20 · an upright margin configured such that the end surface of the first end of a received tread can lie closely adjacent thereto to provide a border for the decking.
18. A modular decking system according to claim 17, the modular decking system incorporating one or more of the abutments according to any one of claims 1 to 16.
- 25 19. A modular decking system according to claim 17 substantially as herein described in relation to the accompanying drawings.

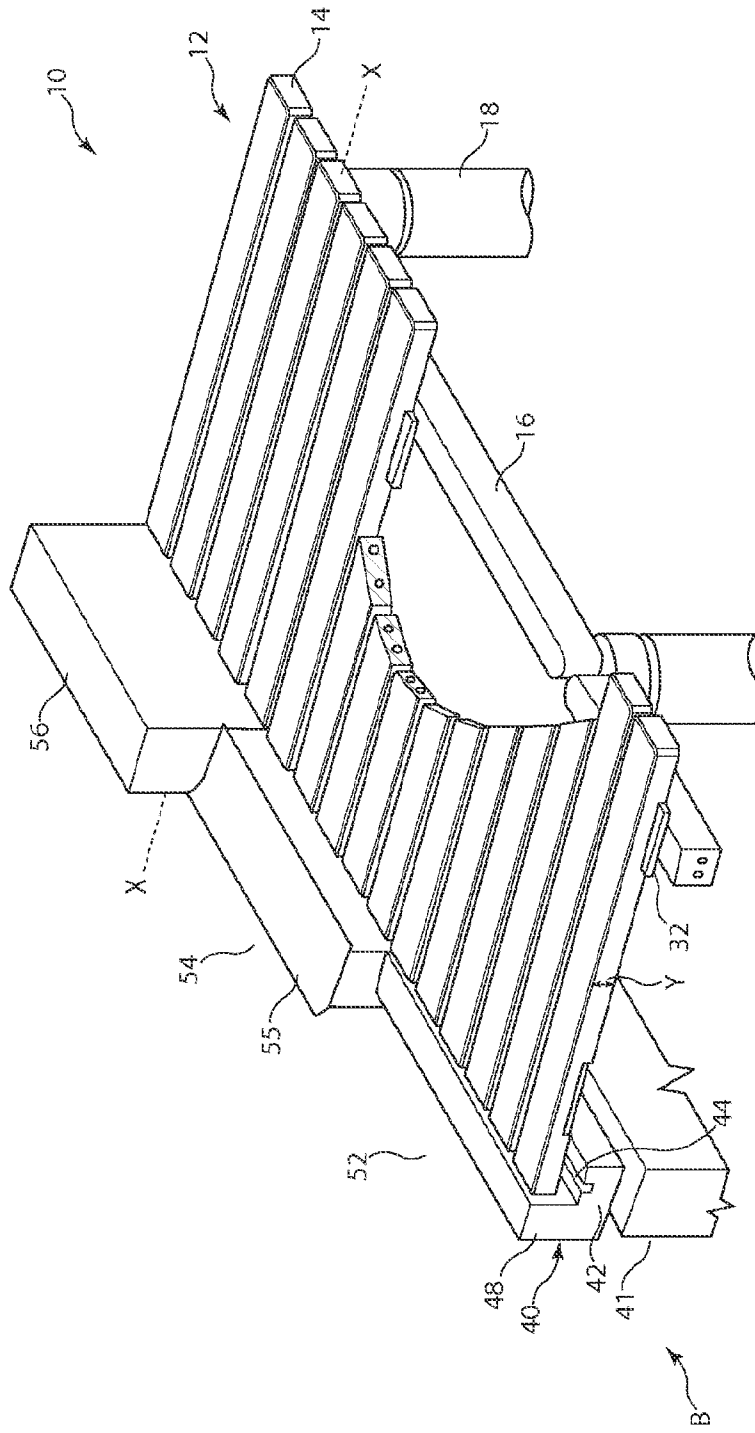


Figure 1

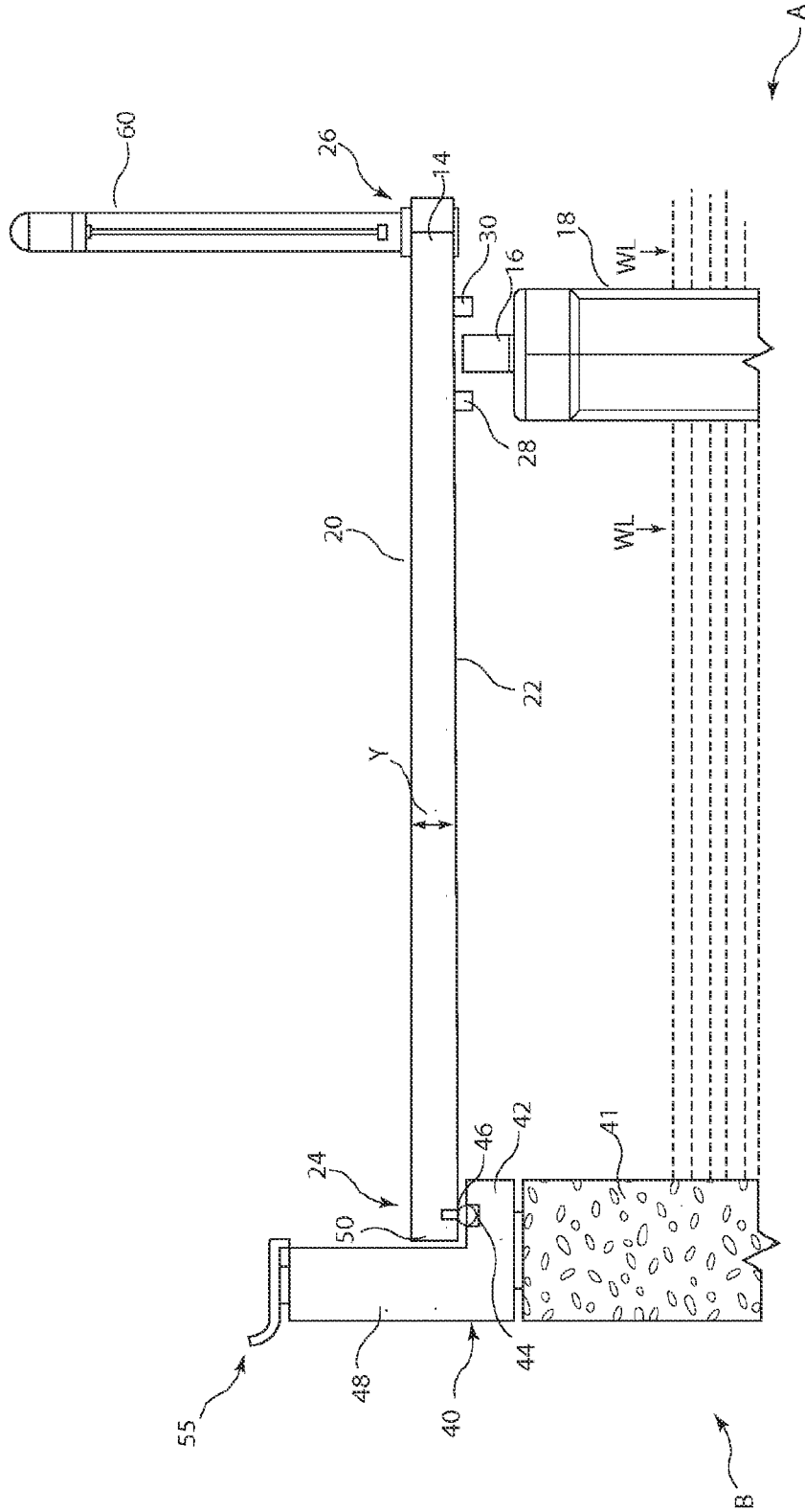


Figure 2

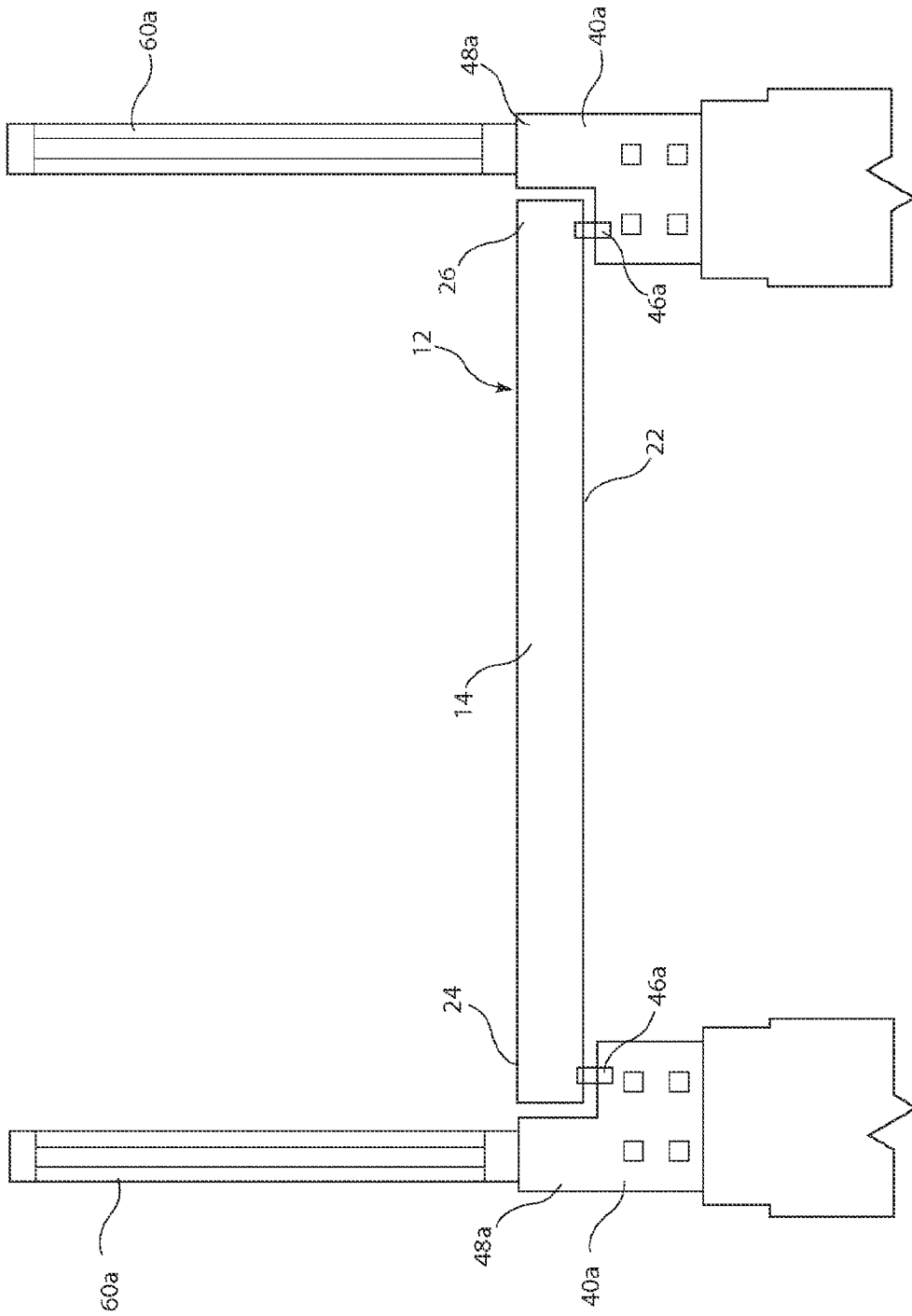


Figure 8

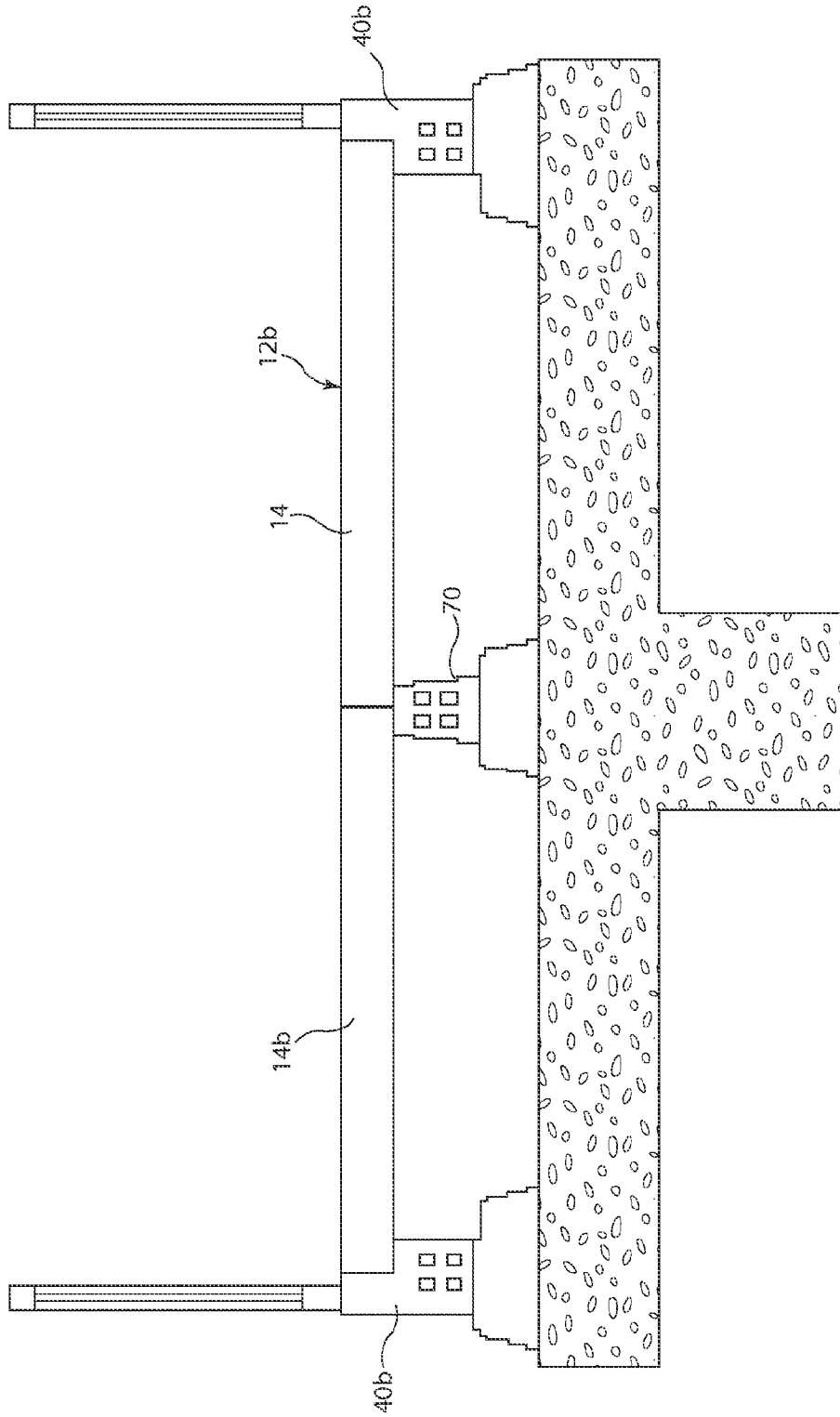


Figure B



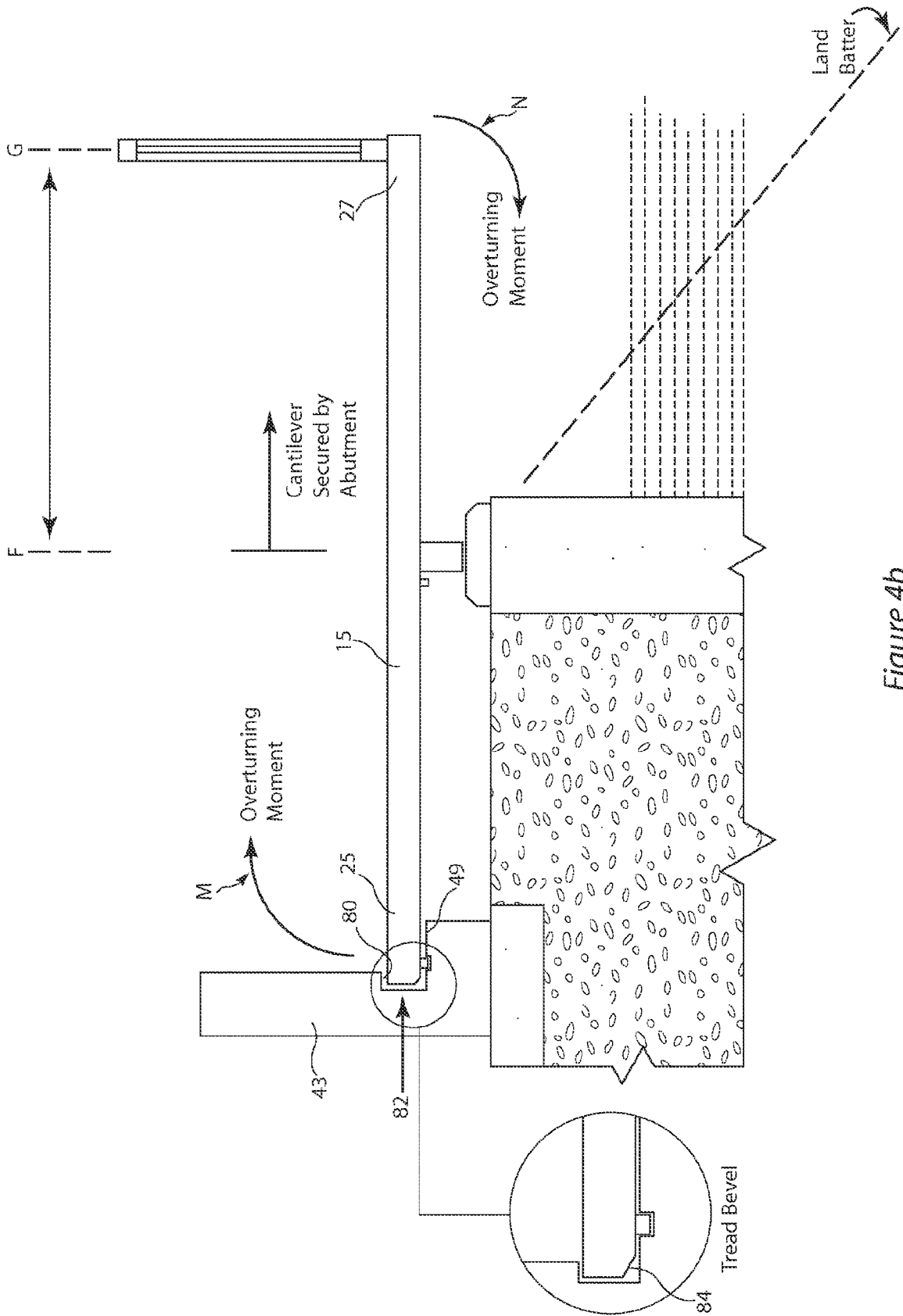


Figure 4b

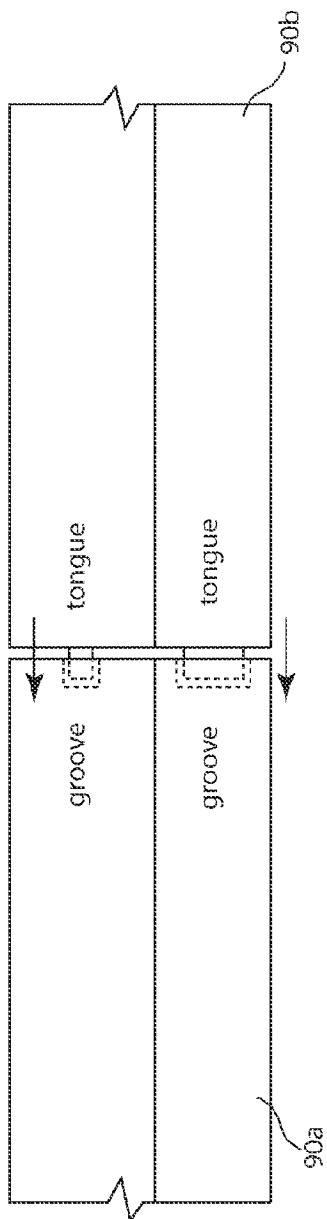


Figure 5a

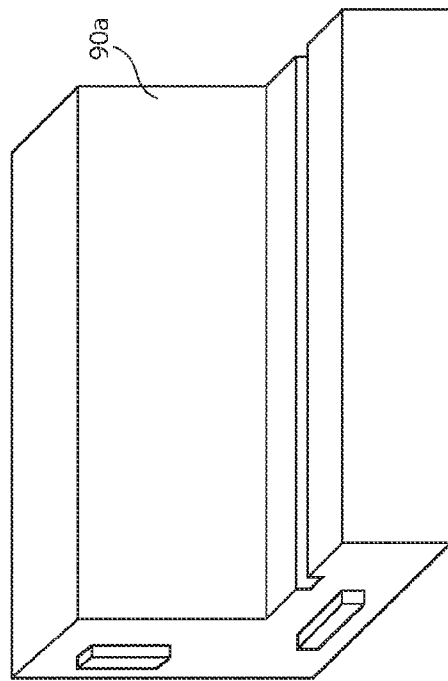


Figure 5b

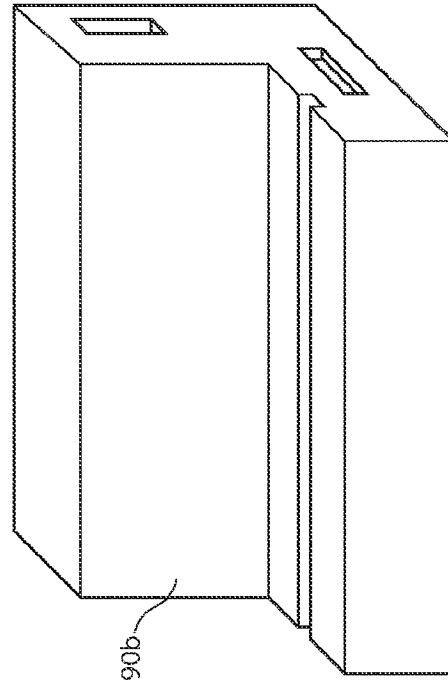


Figure 5c

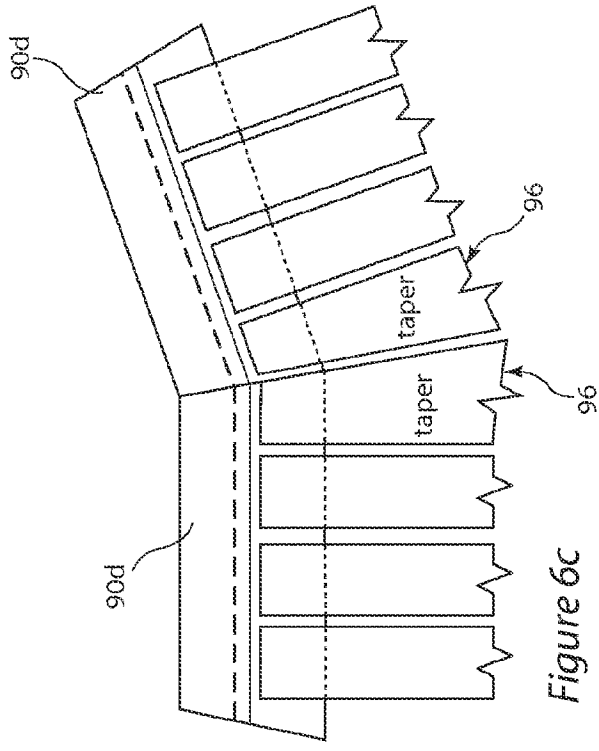


Figure 6c

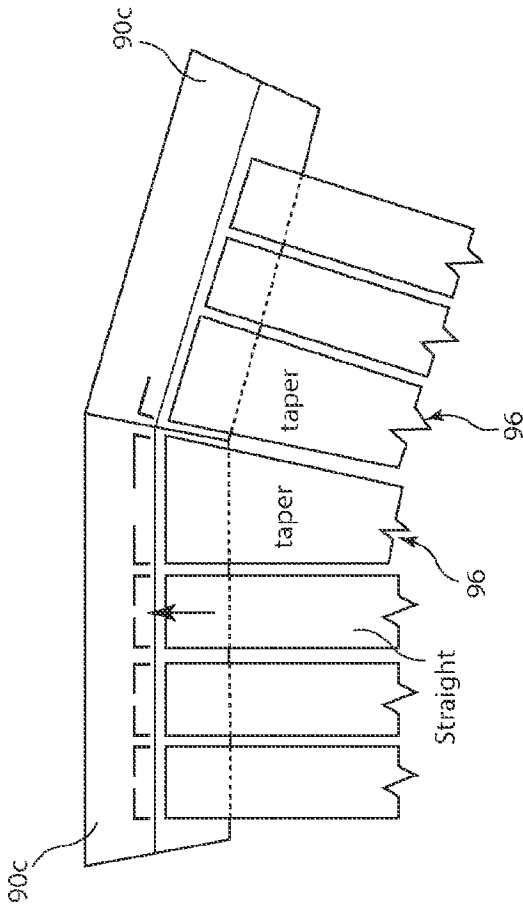


Figure 6a

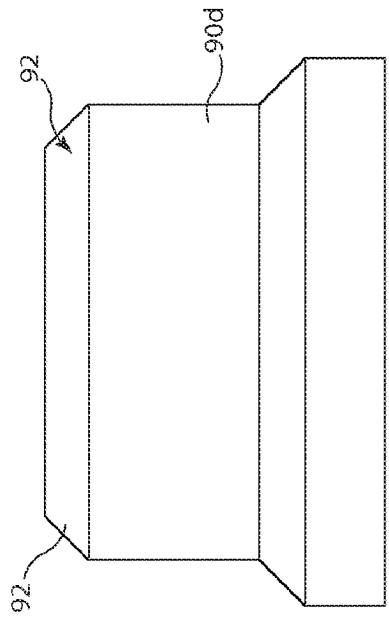


Figure 6d

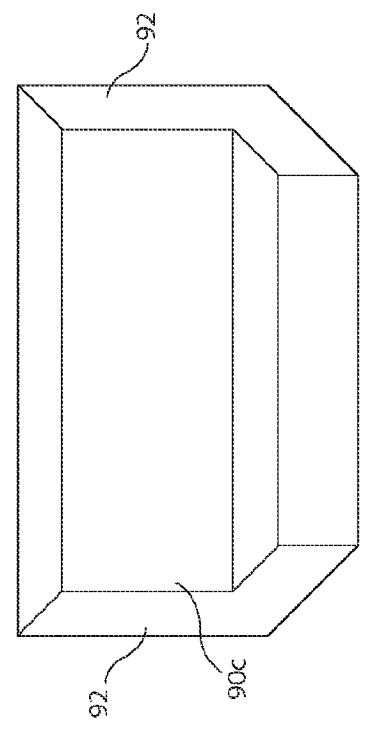


Figure 6b

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/AU2008/000967**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int. Cl.	<i>E01C 5/00</i> (2006.01) <i>E01C 11/00</i> (2006.01)	<i>E01C 11/02</i> (2006.01) <i>E01C 15/00</i> (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Patent databases WPI, EPODOC and keywords, couple, engage, connect, groove, male, female, slot, and like terms		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2003293305 A (GEOSTR Corp.) 15 October 2003. See English language Patent Abstracts of Japan and figures 1-7.	1, 17, 18
Y	JP 2000265410 A (KAJIMA Corp.) 26 September 2000. See English language Patent Abstracts of Japan and figures 1, 8, 10.	1-9, 17, 18
Y	JP 2000096765 A (SHOKO BUSSAN KK) 4 April 2000. See English language Patent Abstracts of Japan and Figures 3A – 3C.	1-6, 17, 18
Y	DE 8110959 U1 (EISENBERG) 6 August 1981. See figure 1.	1-6, 17, 18
Y	JP 11350409 A (ORIENTAL CONSTRUCTION Co Ltd) 21 December 1999. See English language Patent Abstracts of Japan See figure 1.	1-6, 17, 18
Y	WO 2007/051934 A (DECK SYSTEME SARL) 10 May 2007. See figures 1, 5, 12.	1-6, 17, 18
Y	DE 29724621 U1 (KARL VOGT BETONWERK PORTA WESTFALICA) 19 September 2002.	1-6, 17, 18
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>	
Date of the actual completion of the international search <b>02 September 2008</b>		Date of mailing of the international search report <b>17 SEP 2008</b>
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. +61 2 6283 7999		Authorized officer <b>DAVID LEE</b> AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2107

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2008/000967

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member					
JP 2003293305						
JP 2000265410						
JP 2000096765						
DE 8110959						
JP 11350409						
WO 2007051934	CA 2628810	EP 1945881	FR 2893054			
	FR 2893055					
DE 29724621	DE 19738477					
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.						
END OF ANNEX						