

Adjustable Pedestal

Cross-Reference to Related Applications

The present application claims priority from Australian Provisional application No 2010901159, filed on 12 May 2010, the entire content of which is incorporated herein by reference.

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Field of the Invention

This invention relates to an improved pedestal for elevated floors incorporating slope compensation.

Background of the Invention

It is known to provide elevated or raised floors, also known as pedestal floors. Elevated flooring incorporates a number of height adjustable pedestals which are uniformly distributed over a subsurface/subfloor such as a concrete floor of a multi-story building, a roof, terrace, or any other surface on top of which it is desired to locate an elevated floor. Other non-exhaustive applications of pedestal floors include technical floors for laboratories, fitting out old buildings, patios, balconies, swimming pool surrounds and decking. The pedestals cooperate in supporting floor panels, such as pavers, or other floor surfaces. The panel members provide a relatively flat high strength floor.

Problems arise when forming a raised surface on a subfloor/subsurface which is not itself horizontal such as roof terrace which will typically slope at an angle of up to 5% in order to allow water run off.

Although height adjustable pedestals with means for compensating for slope, typically on the head or top of the pedestals are known to address the problem of slope, existing pedestals incorporating slope adjustment are often rather awkward to use and adjust.

International patent application publication No WO 2007/048204 to the applicant of this application describes an improved slope compensator which incorporates slope adjustment. The contents of that publication are incorporated herein by reference. The addition of slope compensation however clearly increases the complexity and cost of the pedestal. Existing slope compensators typically include a setting for zero slope compensation for level floors and compensate for slopes of up to 5%.

Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a

context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

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Summary of the Invention

In one first broad aspect, the present invention provides a pedestal incorporating height adjustment which includes a slope compensator head as well as slope compensation at the base of the pedestal.

10 This has the advantage that slope adjustment can be made at the base of the pedestal or the head of the pedestal or both. Having slope adjustment at the base of the pedestal allows the pedestal to be oriented vertically, rather than perpendicular to a sloping floor.

In a particularly advantageous feature, it is preferred that the pedestal may be
15 used with or without either or both of the slope compensator head and slope compensation at the base of the pedestal.

While existing slope compensators can be used with zero compensation, this is done by adjusting a slope compensation plate to zero slope adjustment. With a pedestal embodying the above advantageous feature, the pedestal can be used on non-sloping
20 floors without the slope compensation head or base, resulting in a simpler and cheaper pedestal.

According to a further aspect of the present invention, there is provided an adjustable pedestal adapted to support panel members of an elevated floor structure comprising:

25 a height adjustable support structure including a base and a head assembly, the base defining a plane on which the support structure may stand in use, said head assembly including:

a head member; and optionally, a top slope adjustment plate; and wherein
the pedestal includes a bottom slope compensator element which sits below the
30 base, in use; and;

wherein the base defines a first part-spherical, typically concave, surface having a first radius of curvature, and the bottom slope compensator element defines a second part-spherical, typically convex, surface having substantially the same radius of curvature as the first surface, and wherein the part spherical convex surface may be
35 supported on the part spherical concave surface, with relative movement of the convex surface on the concave surface adjusting the angle of the planar portion of the

adjustment plate relative to the plane of the base, the head member and slope adjustment plate defining co-operating fixing means for fixing the slope adjustment plate relative to the head member in two or more different relative orientations.

In a particularly preferred embodiment, the base defines at least one depending
 5 peg and the bottom slope compensator element defines one or more arrays of holes for receiving the peg and which extend about the centre of the top surface of the head member. In this preferred embodiment, the holes in each array are not equidistant from the centre of the head member but rather are located on a gentle spiral curve to account for relative movement of the adjustment plate on the head member.

10 The pegs preferably are defined by hollow cylinders through which fastening means may be passed to secure the base to the sub-floor.

The top slope adjustment plate preferably defines a third convex part-spherical surface on its underside and two depending fixing means in the form of depending pegs and the head preferably defines a central aperture encircled by an fourth, annular, part
 15 spherical surface having substantially the same radius of curvature as the third part-spherical surface, there being two sets of holes defined in the fourth surface arranged on a spiral curve, for receiving the pegs.

The head may define a substantially planar flange surrounding the fourth, annular, part spherical surface. The centre of the head may define a hole for receiving
 20 a depending lug of a paver separator.

The adjustment plate is typically generally circular in plan view. Preferably, the top of the adjustment plate is marked with a cross passing through the centre of the plate, typically in the form of a relatively shallow groove. One line/arm of the cross is preferably clearly marked with an arrow and "UP SLOPE" or the like to indicate that,
 25 in use, the arrow/arm should point in the direction of the upwards slope of the subfloor.

In a preferred embodiment, four series of typically six apertures, are defined in the slope adjustment plate. The apertures may have particular shape, e.g. triangular, and a correspondingly shaped protrusion projects up from the head member and slots through into one of the six apertures. The degree of slope compensation (typically 0%
 30 to 5%, in one per cent increments) provided by the head assembly is indicated by which aperture the protrusion is located in. The protrusion is most preferably in a contrasting colour to the colour of the slope compensation plate. The numbers zero to five are typically defined on the adjustment plate adjacent the aperture providing that percentage of slope compensation.

To provide a combination of light weight and sufficient strength, the pedestal is typically injection moulded in a plastics material such as polypropylene, however other suitable materials or manufacturing methods could be used.

Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

Brief Description of the Drawings

A specific embodiment of the present invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figure 1 is a side view of a height adjustable pedestal having top and bottom slope correction embodying the present invention;

Figure 2 is an isometric view of the height adjustable pedestal of Figure 1, seen from the underside;

Figure 3 is an exploded isometric view from above of two components of the pedestal of Figure 1, providing top slope correction;

Figure 4 is an exploded isometric view from below of the two components shown in Figure 3;

Figure 5 is an exploded isometric view from above of two components of the pedestal of Figure 1, providing bottom slope correction;

Figure 6 is an exploded isometric view from below of the two components shown in Figure 5;

Figure 6a is a top plan view of a base component shown in Figure 6;

Figure 7 is a section through the two components shown in Figure 1, providing bottom slope correction;

Figure 8 is an isometric view showing a height adjustable pedestal set up for bottom slope compensation only;

Figure 9 is an isometric view showing a height adjustable pedestal set up for top slope compensation only; and

Figure 10 is a side view of the height adjustable pedestal of Figure 9.

Detailed Description of Preferred Embodiments.

Referring to the drawings, Figures 1 and 2 shows a height adjustable pedestal incorporating slope adjustment at both its top and its base/bottom, embodying the present invention. The pedestal 10 comprises a number of components, specifically a

bottom slope compensator element 12, a generally cylindrical base element 14, a generally cylindrical head element 16, and a top slope compensator plate 18. Also visible in Figure 1 is a cruciform paver separator 20.

With reference to figure 3, the head element 16 defines an upper portion 22 and a depending externally threaded cylindrical portion 24 which mates with a co-operating internal thread in the base element 14. Relative rotation of the two elements raises or lowers the height of the pedestal. The height of the pedestal may be further increased by the use of one or more intermediate spacer elements (not shown) located between the head element 16 and the base 14. The spacer elements have a lower externally threaded portion which threads inside the base 14, and an upper internally threaded portion which receives the externally threaded head, or the lower part of another spacer element where greater height is required.

Figures 3 and 4 illustrate the features of the slope compensating head assembly of the present invention in more detail. The assembly operates on similar principals as the slope compensator head described in the applicant's PCT application WO 2007/048204 discussed above in the introduction, albeit with some changes. As discussed above, the head member, best seen in Figure 3, comprises a head portion 22 from which the annular externally threaded cylindrical portion 24 depends.

In the centre of the head portion 22, there is a central circular aperture 26. Extending around the circular aperture 26 is a circular wall 28 whose centre is offset from the aperture 26. Extending around the wall 28 is a part spherical (convex) surface 30 which extends between the perimeter/circumference of the circular wall 28 and a concentric circular ridge 32. Between the ridge 32 and the perimeter of the convex surface there is a flat annular portion 34 in the same plane as the top of the circular wall 28. An annular flange 36 extends from the circular ridge 32 to the edge of the head member. The height of the top of the annular flange is slightly higher (about 2-3mm) than the top of the circular wall

Sectors 38 of the annular flange 36 are recessed slightly relative to the upper surface of the flange. A series of radially aligned strengthening ribs 40 extend either side of each recessed sector 38, across the flange from the circular ridge 32 to the perimeter edge of the flange 36. A series of drainage holes 42 are formed in the sectors 38 of the flange between adjacent pairs of ribs to prevent build up of water.

Two series of six generally tubular apertures 44, 45 extend through the part spherical surface 30. In use, the apertures may receive one of two diametrically opposed pegs which depend from the slope adjuster plate 18 to be described in more detail below. The pegs have slightly different diameters. Although the tubular

apertures are superficially similar in appearance, in fact the axes of the tubes are slightly different and apart from a 0% compensation pair of opposed apertures are offset relative to the vertical axis of the pedestal, to compensate for the different orientations of the slope adjuster plate on the head member. The apertures are positioned so that diametrically opposed pairs are aligned at the same angle. The centre of the tubes are not arranged equidistantly from the centre of the head member but are arranged in two part spirals each extending through 180°, to account for the differences in position of the slope adjuster plate on the head member. As will be explained in more detailed below, to ensure that the top slope compensator plate can only be inter-engaged with the head correctly, one set of apertures 44 is distinguished from the other 45 by having a relatively larger diameter corresponding to the diameters of the two pegs.

A yellow triangular marker 46 is defined in one of the sectors 38, which in use is visible through the slope adjuster plate 18, as will be described in more detail below.

The slope adjuster plate 18 is also best seen in Figures 3 and 4. It is generally circular in plan view. The top surface 50 includes a central circular portion 52 which is recessed relative to an outer ring 54. A circular aperture 56 is defined in the centre of the adjuster plate. As is best seen in Figure 4 a first circular skirt portion 58 depends from the underside of the plate/perimeter of the circular aperture 56, and a larger diameter circular skirt portion 60 also depends down from the underside of the slope adjustment plate spaced from and encompassing the aperture 56 and having a centre which is offset from the centre of the aperture 56.

The top surface of the adjustment plate is marked with a cross 62 passing through the centre of the plate formed by intersecting relatively shallow grooves 64 and 66. One groove, 66, is marked with an arrow 68 and the words "UP SLOPE". In use, the arrow 68 should point in the direction of the upward slope of the subfloor.

A series of six spaced triangular apertures 70 are defined in the top surface of the slope adjustment plate. In use, it is possible to see the yellow triangular marker 46 through one of the apertures, depending on the relative orientation of the plate 18 and head member 16. In the described embodiment the degree of slope compensation is from 0% to 5%, in one per cent increments and the apertures are numbered 0% to 5% to indicate the selected degree of slope compensation.

The underside of the slope compensation plate defines a convex part spherical engagement surface 72 extending in an annular band outside the skirt 60. The surface 72 is not continuous but is defined by the lower edges of an array of radially extending ribs 74.

Two diametrically opposed cylindrical pegs 76 and 78 depend down from the convex surface adjacent opposite edges of the skirt 58, one peg 78 having a relatively larger diameter than the other 76.

5 The ribs 74 extend/project beyond the part spherical surface 72 and increase in depth towards the edge of the slope adjuster plate 18 to define deeper sections 80 where in use the slope adjuster plate 18 sits over the recessed sectors 38 of the head portion 22 so that any weight on the plate is transferred to the sectors 38 via the ribs.

10 The bottom slope compensation components are best seen in Figures 5 to 7. The base 14 comprises a cylindrical tube 100 having an annular cross section and defining an open upper end 102 which is internally threaded and a base which is part closed by a circular wall or plate 104 which defines a central hole 105. A drainage hole 106 is also formed in the perimeter of the plate. The plate defines a series of radially extending drainage grooves 108 to allow water to flow under the plate.

15 A generally trumpet shaped annular flange 110 extends away and down from the cylindrical portion to a further external planar annular flange 112. The flange 110 is part spherical and is defined between two parallel circles circumscribing a sphere. The flange 112 is rimless to minimise collection of water. A series of generally triangular buttresses/webs some 114 being larger and some 116 relatively smaller extend from the flange 112 to the outer face of the cylindrical portion 100. The larger buttresses 114
20 divide the flange into eight sectors. As is best seen in Figure 7, the slope of the flange 110 is about 30° to the horizontal to provide a slope encourage water flow and prevent pooling of water. In particular, the slope of the flange 112 prevents water from pooling between the buttresses/webs.

A series of six triangular notches or recesses 118 (numbered 0% to 5%) and best
25 seen in Figure 6a, are defined in the edge of the external flange 112. The flange also defines a triangular aperture 117 adjacent the lettering "DOWNSLOPE" indicating the correct orientation of the base relative to the down slope. There is a circular cut out 115 in the flange 112 adjacent the aperture 114.

30 The base also defines a through hole 119 adjacent its open upper end for receiving a locking screw (not shown) for fixing the base to a component threaded into the base.

Four cylinders or tubes 120 each having an annular cross section and defining a central tubular aperture extend through the flange, spaced around the flange by 90° from one another. As can be seen, the tubes project upwardly from the flange and also
35 (with reference to Figure 6) depend down from the underside of the flange and their lower ends are in the same plane as the end wall 104. While superficially similar, the

diameter of the cylinders 120 are different to ensure that the base can only be connected with the bottom slope compensator element 12 in pre-determined arrangements, preventing mis-assembly. Also visible in Figure 6 are drainage channels 122 in the underside of the edge of the external flange 112.

5 As discussed above, the pedestal 10 includes a bottom slope compensator element 12 which will now be described in detail with reference to Figures 5 to 7. The centre of the bottom slope compensator element comprises a circular well 200 having a base 202 and a circular side wall 204. The well is sized to receive the circular base wall 104 of the base 14. Spaced around the perimeter of the well 200 there are a series
10 of drainage holes 206. A locking element 208 projects up from the centre of the base 202 comprising four flexible deformable upstanding elements 210, 212, two of which are thinner and more flexible define lateral wings 214 on their ends. In use the locking element locates inside the central hole 105 of the base 14 for preventing accidental disengagement of the two, while allowing some relative movement and adjustment of
15 the two components.

The element 12 includes an annular part spherical portion 215 which extends from the top of the wall 204 of the well to a narrow annular flange 216 adjacent an end wall 218 defining the perimeter of the element. A series of drainage holes 222 are defined in the end wall.

20 Four arrays 220 of six circular recesses are defined in the part spherical portion 215 spaced around the portion at approximately 90° intervals. Each array of recesses is arranged in a spiral pattern with one recess 220a closest to the well and the following recesses at gradually increasing distances from the well to the 6th recess 220g which is farthest from the well. The recesses are sized so that each of the cylinders 120 of the
25 base can be only inserted into the recesses of one specific array to prevent mis-assembly of the components.

It will be appreciated that the slope compensator may be used with both bottom and top slope correction as shown in Figures 1 and 2. It may also be used without the bottom slope compensator element 12 using only top slope compensation as illustrated
30 in Figure 8, or by omitting the top slope compensator plate 18 and using only bottom slope correction, as is illustrated in Figures 9 and 10. It may also be used (not illustrated) without either slope corrector on flat sub-floors.

Use of the top slope compensator will now be described. When placed in the correct orientation on top of the head portion 16, the triangular marker 46 is visible
35 below one of the six triangular apertures 70 indicating the degree of slope compensation from 0% to 5%. The circular wall 28 is a close/interference fit inside the

larger diameter skirt portion 60 on the underside of the top slope compensator plate 18. The larger and smaller pegs respectively locate in opposed apertures 44, 45 in the top of the head portion. As the larger peg will not fit in the smaller apertures 45 mis-assembly is prevented. In this arrangement forces are transmitted from the slope compensator plate to the head by the through contact of the ribs 74 with the convex surface 30 of the head and by contact between the underside of the slope compensator plate 18 and top of the head portion 16 generally. The slope can be adjusted by lifting the slope compensator plate 18, and rotating it relative to the head portion 16 until the marker 46 is below the aperture 70 indicating the desired degree of slope compensation and inserting the pegs into the corresponding apertures 44, 45 below the pegs.

A cruciform paver separator 20 may be inserted into the circular aperture 56 of the slope compensator plate 18.

Bottom slope compensation operates on similar principals to the top slope compensation. The base element 14 is located over the bottom slope compensator element 12. The bottom 104 of the base locates inside the circular well 200 of the bottom slope compensator element 12. The four depending cylinders 120 each locate in one of the recesses 220a to 220g of the array, depending on the degree of slope compensation required. The compensation is adjusted by raising the base element 14 and turning through the necessary angle relative to the bottom slope compensator element 12 to obtain the desired amount of slope compensation. Having the slope compensation at the base of the pedestal has the advantage that the pedestal is always substantially vertical, as compared with using top slope compensation where the pedestal is at an angle to the vertical corresponding to the slope of the sub-floor.

Being hollow the cylinders 120 can then be used to secure the base 14 and bottom slope compensator element 12 to the sub-floor by inserting a fastener through the cylinder into the sub floor.

Because the top surface of the head is substantially all in the same plane it is possible to use the pedestal without the top slope compensator plate. This is shown in Figure 8. The cruciform paver separator defines a depending annular cylinder which is an interference fit in the circular aperture 26 of the head element 16. The thickness of the paver separator corresponds to the distance the top of the wall 28 is from the level of the flange so that once inserted in the head 16 the pedestal defines a generally planar top surface as shown in Figure 8.

It is also possible to use top slope compensation only and omit the bottom slope compensation as shown in Figures 9 and 10. This is possible as the base wall 104 and

annular flange 112 are in substantially the same plane. In this case the base 14 is fastened directly to the sub-floor using fasteners passing through the tubes 120.

Where the sub-floor is horizontal and when no slope compensation is required it is possible to omit both the bottom slope compensator element and the top slope compensator plate, reducing the number of components required and resulting in a significant costs saving.

When both compensators are used, it is possible to use either the top or bottom slope compensator to provide the adjustment leaving the other compensator set to 0%. However, it is also possible to use the top and bottom slope correctors concurrently to achieve 0 to 10% slope correction.

Numerous variations to the described embodiment are possible. For example, although 0 to 5% slope compensation is provided in the described example, it will be appreciated that it would be possible to create say 0 to 6% compensation, in which case 14 holes will be provided in the central concave area of the head member, or greater degrees of compensation such as 0 to 10% or more. Different degrees of compensation may be provided for the bottom and top slope compensation.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A pedestal incorporating height adjustment which includes a slope compensator head providing slope compensation at both the top of the pedestal as well as a slope compensation element at the base of the pedestal, providing slope compensation at the
5 base of the pedestal.
2. A pedestal incorporating height adjustment including a base and a head member and wherein the head member is configured to be used with a slope compensator head for adjusting the angle of the head relative to the base by rotation of the slope
10 compensator head relative to the head member, wherein the head member also defines at least a first planar annular support surface for directly supporting a paver or the like and wherein the base is configured to engage with a bottom slope compensator element which sits below the base in use and can be rotated relative to the base to adjust the slope of the base and wherein the base defines at least one planar annular surface which
15 is adapted to directly support the base such that the pedestal is configured to be used with or without either or both of the slope compensator head and the bottom slope compensator element at the base of the pedestal.
3. A pedestal incorporating height adjustment as claimed in claim 2 wherein the
20 head member defines a second annular support surface, co-planar with the first annular support surface and optionally, co-planar ribs extending between the annular surfaces.
4. An adjustable pedestal adapted to support panel members of an elevated floor structure comprising:
25 a height adjustable support structure including a base and a head assembly, the base defining a plane on which the support structure may stand in use, said head assembly including:
a head member; and optionally, a top slope adjustment plate; and wherein
the pedestal includes a bottom slope compensator element which sits below the
30 base, in use; and;
wherein the base defines a first part-spherical, typically concave, surface having a first radius of curvature, and the bottom slope compensator element defines a second part-spherical, typically convex, surface having substantially the same radius of curvature as the first surface, and wherein the part spherical convex surface may be
35 supported on the part spherical concave surface, with relative movement of the convex surface on the concave surface adjusting the angle of the planar portion of the

adjustment plate relative to the plane of the base, the head member and slope adjustment plate defining co-operating fixing means for fixing the slope adjustment plate relative to the head member in two or more different relative orientations.

5 5. An adjustable pedestal as claimed in claim 4 wherein the base defines at least one depending peg and the bottom slope compensator element defines one or more arrays of holes for receiving the peg and which extend about the centre of the top surface of the head member.

10 6. An adjustable pedestal as claimed in claim 5 wherein the holes in each array are located on a spiral curve.

7. An adjustable pedestal as claimed in claim 5 or claim 6 wherein the pegs are defined by hollow cylinders through which fastening means may pass to secure the
15 base to the sub-floor.

8. An adjustable pedestal as claimed in any one of claims 5 to 7 wherein four arrays of holes are provided, the arrays being spaced at 90° intervals in the second part spherical surface

20 9. An adjustable pedestal as claimed in any one of claims 4 to 8 wherein the top slope adjustment plate defines a third convex part-spherical surface on its underside and two depending fixing means in the form of depending pegs and the head defines a central aperture encircled by an fourth, annular, part spherical surface having
25 substantially the same radius of curvature as the third part-spherical surface, there being two sets of holes defined in the fourth surface arranged on a spiral curve, for receiving the pegs.

10. An adjustable pedestal as claimed in claim 9 wherein the head member defines a
30 substantially planar flange surrounding the fourth, annular, part spherical surface and wherein the head member defines a centrally located hole for receiving a depending lug of a paver separator.

11. An adjustable pedestal as claimed in any one of claims 4 to 10 wherein the top
35 slope adjustment plate is generally circular in plan view and is marked with a cross

passing through the centre of the plate, typically in the form of a relatively shallow groove.

12. An adjustable pedestal as claimed in claim 11 wherein one line/arm of the cross
5 is preferably clearly marked with an arrow and wording such as "UP SLOPE" or a symbol or the like to indicate that, in use, the arrow/arm should point in the direction of the upwards slope of the subfloor.

13. An adjustable pedestal as claimed in any one of claims 4 to 12 wherein four
10 series of apertures, are defined in the slope adjustment plate, and a correspondingly shaped protrusion projects up from the head member and slots through into one of the six apertures, with the degree of slope compensation (typically 0% to 5%, in one per cent increments) provided by the head assembly being indicated by a number, letter or symbol adjacent the aperture in which the protrusion is located, the protrusion being in
15 a contrasting colour to the colour of the slope compensation plate.

14. An adjustable pedestal substantially as hereinbefore described with reference to Figures 1 to 7, or Figure 8 or Figures 9 and 10 of the accompanying drawings.