

Improvements in or relating to Sealing Assemblies

The present invention concerns improvements in or relating to sealing assemblies, and the like, for providing a watertight sealing engagement between an earthing rod, for
5 example, and a building slab through which the rod may pass.

It is commonplace to provide buildings with earthing rods, which act as conductors for lightning. These rods typically travel from beyond the highest point of the building to the subsoil to provide a conductive pathway for lightning to pass to the ground. For
10 buildings which are erected on concrete slabs, and the like, it is necessary for the rod to pass through the slab to reach the subsoil underneath.

In such situations it is desirable to provide a seal between the rod and the slab to prevent ingress of water from the subsoil into the building. Often, the rod will penetrate a
15 waterproof membrane, such as a damp course, which is adapted to prevent moisture rising into the building. It is preferable that the rod is sealed to the slab and such a membrane in a watertight manner to maintain the waterproof barrier.

An apparatus suitable for providing a seal between an earthing rod and a building slab is
20 disclosed in UK Patent GB 2 226 343 B. The apparatus comprises a support member adapted to provide a housing in which sealing means and an earthing rod may be disposed. The support member may be incorporated within the slab and sealed to a waterproof membrane, should one be provided on or within the slab.

25 An example of the known apparatus is illustrated in Figure 1. As shown, the support member 100 generally comprises a bore 102 dimensioned such that the earthing rod 104 may pass through the support member 100 via the bore. At one end of the support member 100 is a socket 106 into which a tube 108 may be received; the tube 108 being configured to surround the earthing rod 104 as it extends through the slab. At the
30 opposite end of the support member is a housing portion 110 which contains lower and upper annular sealing means 112, 114 configured to provide a sealing engagement between the housing portion 110 of the bore 102 and the earthing rod 104. The sealing means 112, 114 each comprise an O-ring and a compression ring. A cap 116 is

removably attached to the support member to enclose the housing portion 110 and prevent the ingress of dust. The cap 116 is configured to bear down upon the sealing means to prevent them from moving.

- 5 From time to time, it is desirable to have access to the support member to remove or inspect the earthing rod and the peripheral components of the apparatus for damage. It may be desirable to replace the earthing rod, for example, the compression rings or the O-rings, should they deteriorate to a state where they no longer provide a watertight seal.
- 10 In the apparatus disclosed in GB 2 226 343 B, and illustrated in Figure 1, this may be achieved by removing the cap from the support member, and prising the lower and upper sealing means from the housing portion using the flat blade of a screwdriver, or the like. This process is illustrated in Figures 2A and 2B.
- 15 As shown in Figure 2A, removal of the upper sealing means 114 is achieved by inserting the blade of a screwdriver 117, or the like, into the bore 110 between the outer surface of the sealing means 114 and the inner surface of the bore 110. The removal process requires levering the sealing means 114 until it is removed from the support member 100.
- 20 Likewise, as shown in Figure 2B, removal of the lower sealing means 112 is achieved by inserting the blade of the screwdriver 117 even further into the bore 110 between the outer surface of the lower sealing means 112 and the inner surface of the bore 110. Once again, the process requires levering to remove the lower sealing means 112 from the
- 25 bore 110.

Whilst effective, and achievable using conventional tools, this method of removing the compression rings is not without its drawbacks. For example, even with the use of a screwdriver, the lower sealing means in particular can be difficult to access. What is
30 needed, therefore, is an apparatus configured such that access to each of the two compression rings is improved.

Furthermore, the use of a screwdriver, or similar tool, to remove the compression rings requires inserting the blade between the sealing means and the bore to prise one from the other. In doing so, it is easy for both the sealing means and the bore to become damaged. Reinserting damaged compression rings into the bore may cause further
 5 damage. Such damage is particularly problematic in circumstances where it is not possible to replace the support member or even remove it from the slab for repair. What is needed, therefore, is an apparatus configured such that each of the two sealing means may be removed from the support member without the need to insert a tool into the bore.

10 Accordingly, the present invention provides an apparatus for providing a watertight seal between an earthing rod and a slab. The apparatus comprises a support member mountable on the slab, the support member having a surface and a bore extending through the support member from an opening at the surface. The apparatus further comprises a first annular sealing means for sealing against the bore; and a second
 15 annular sealing means for sealing against the rod. The first and second annular sealing means are disposed within the bore, in use, and each sealing means is accessible from the surface of the support member when so disposed.

By providing an apparatus wherein both first and second sealing means are accessible
 20 from a surface of the support member, access to the means is improved over the known arrangement described above. Furthermore, it is not necessary to insert a tool into the bore to remove either of the sealing means, as they need only be manipulated at the surface of the support member. Accordingly, damage to the bore is prevented and the risk of damage to the compression rings is significantly reduced.

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In preferred embodiments, each sealing means comprises a compression ring and at least one O-ring. The O-ring provides a superior watertight seal between the rod and the bore, whilst the compression ring maintains such a seal by ensuring that the O-ring is adequately compressed against its respective component, in use.

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In one embodiment, a first O-ring of the first sealing means is adapted to provide a watertight seal between the compression ring of the first sealing means and the bore, and a first O-ring of the second sealing means is adapted to provide a watertight seal between

the compression ring of the second sealing means and the rod. In this manner, a complete watertight seal is provided when both the first and second sealing means are disposed within the support member, in use. Each O-ring is adapted to seal a gap between its respective compression ring, and either the earthing rod or the bore.

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Among other advantages, this arrangement allows for the compression ring of each sealing means to be precisely dimensioned to exert the correct amount of compression, when placed within the bore, to an O-ring disposed around one of its surfaces. This arrangement ensures that an effective watertight seal is provided.

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Of course, this arrangement is merely optional. Alternative embodiments may provide one or more compression rings, each having two or more seals disposed around one or more surfaces of the compression ring. An annular compression ring may thus be provided with an O-ring disposed around each of its inner and outer surfaces, for example, to provide a sealing engagement between it and the components with which it comes into contact.

The bore may have a proximal end adjacent the opening and the compression rings of the first and second sealing means may, in use, be disposed distally of the proximal end.

20 The distance in the distal direction between the first and second sealing means and the proximal end of the bore may depend on particular circumstances. In certain embodiments, the compression rings of the sealing means may be adjacent within the bore, and the proximal-most surface of the proximal-most sealing means may be flush with the surface of the support member. Alternatively, the two sealing means may be

25 spaced apart from each other within the bore, and the proximal-most surface of the proximal-most compression ring may be spaced apart from the surface of the support member.

In one embodiment, the compression ring of the first sealing means may, in use, be

30 disposed distally of the compression ring of the second sealing means. In an alternative embodiment, the compression ring of the first sealing means may, in use, be disposed proximally of the compression ring of the second sealing means.

In certain embodiments, as described above, the first and second compression means are provide adjacent each other. In such embodiments, it is preferable to provide a seal between the two compression means, such that a gap between the two compression means is provided with a watertight seal, just as any gaps between the compression rings
5 and the rod and bore are also provided with seals, as described above.

Optionally, the first O-ring of the second sealing means is adapted to provide a watertight seal between the first and second compression rings. Alternatively, the first O-ring of the first sealing means is adapted to provide a watertight seal between the first
10 and second compression rings. In another embodiment, one of the first sealing means and the second sealing means comprises a second O-ring, the second O-ring being adapted to provide a watertight seal between the first and second compression rings.

One advantage of providing such a seal using the O-ring of one of the first and second
15 compression rings is that an overall reduction in the number of components is achieved. One advantage of providing one of the first and second compression rings with a second O-ring is that manufacturing tolerances are rendered less critical to achieving a watertight seal.

20 In preferred embodiments, one or more of the first and second sealing means comprises a flange adapted to facilitate engagement with said one or more sealing means, the flange extending, in use, to a location adjacent the opening.

By providing a flange which extends to a location adjacent the opening when the sealing
25 means on which it is disposed is in place within the bore, access to that sealing means is achievable simply by manipulating the flange adjacent the opening. Accordingly, it is not necessary to access the sealing means within the bore. A flange may be placed on the first sealing means, the second sealing means or both sealing means, as desired.

30 Preferably the flange is substantial enough to be gripped by pliers. Alternatively, the blade of a screwdriver may be used to prise the flange from the opening. In either case, the sealing means may be accessed by manipulating the flange only, and without having to insert a tool within the bore.

In preferred embodiments, one or more of the first and second sealing means comprises a notch adapted to facilitate engagement with said one or more sealing means, the notch positioned, in use, at a location adjacent the opening.

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As with the flange, by providing a sealing means with a notch such that the notch is adjacent the opening when the sealing means on which it is disposed is in place within the bore, access to that sealing means is achievable simply by manipulating the notch adjacent the opening. Accordingly, it is not necessary to access the sealing means by
10 inserting a tool within the bore. A notch may be placed on the first sealing means, the second sealing means or both sealing means, as desired.

Preferably the notch is configured to engage pliers, or a blade of a screwdriver, such that purchase may be gained on the sealing means when it is in place, without having to
15 insert a tool within the bore.

Optionally, one or more of the first and second sealing means may comprise both a flange and a notch.

20 In a preferred embodiment, the first sealing means comprises a flange and the second sealing means comprises a notch. In this embodiment, the first sealing means is disposed distally of the second sealing means.

In another preferred embodiment, the first sealing means comprises a flange, and the
25 second sealing means comprises a flange and a notch. In this embodiment, the first sealing means is disposed proximally of the second sealing means.

Embodiments of the invention will now be described in detail with reference to the accompanying drawings in which:-

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Figure 1 illustrates a sealing assembly of the prior art;

Figure 2A illustrates a procedure for removing a sealing means from the sealing assembly of Figure 1;

Figure 2B illustrates a procedure for removing a further sealing means from the sealing
5 assembly of Figure 1;

Figure 3 illustrates a first embodiment of a sealing assembly according to the present invention;

10 Figure 4A illustrates a procedure for removing a sealing means from the sealing assembly of Figure 3;

Figure 4B illustrates a procedure for removing a further sealing means from the sealing assembly of Figure 3;

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Figure 5 illustrates a second embodiment of a sealing assembly according to the present invention; and

Figure 6 illustrates a third embodiment of a sealing assembly according to the present
20 invention.

Throughout the description of the preferred embodiments, 'lower' or 'distal' shall refer to a direction toward the subsoil into which an earthing rod extends and 'upper' or 'proximal' shall refer to a direction away from that subsoil.

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A first embodiment of the present invention is illustrated in Figure 3. As with the sealing assembly of the prior art, the present sealing assembly comprises a support member 300. The support member 300 is adapted to be mounted in a building slab, such as a concrete slab, for example, to maintain a watertight seal between an earthing rod
30 passing through the slab, and a waterproof member such as a damp course, or the like, extending across the slab.

The support member 300 generally comprises a bore 302 dimensioned such that an earthing rod 304 may pass through the support member 300 via the bore. The bore extends from an opening 320 at an upper surface 330 of the support member 300. The bore has an inner surface and an interior cross section which varies along the length of the bore. Immediately adjacent the opening 320, the bore widens in diameter. At a distal end (the lower end) of the support member 300 the bore forms a socket 306 into which a tube 308 may be received. The tube 308 is configured to surround the earthing rod 304 as it passes through the building slab. Two rubber O-rings are provided at the socket between the inner surface of the bore and the outer surface of the tube.

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Adjacent the proximal end (the upper end) of the support member, the bore forms a housing portion 310 which is adapted to contain lower and upper (or first and second, respectively) annular sealing means 312, 314 configured to provide a sealing engagement between the inner surface of the bore 302 and the earthing rod 304. The sealing means 312, 314 each comprise an O-ring and a compression ring.

A cap 316 is removably attached to the support member to enclose the housing portion 310 and prevent the ingress of dust. The cap is configured to bear down upon the upper (i.e. second) sealing means 314 which, in turn, bears down upon the lower (i.e. first) sealing means, such that both sealing means are preventing from moving, in use.

The first and second sealing means of the first embodiment of the invention can be seen in more detail in Figures 4A and 4B.

As illustrated, the first and second (lower and upper, respectively) sealing means 312, 314 are positioned within the sealing apparatus, in use. In this position, the sealing means are disposed within the bore distal of the opening 320 of the bore 310. The first sealing means 312 is distal of the second sealing means 314.

The first sealing means 312 comprises an annular compression ring 322, which is configured to maintain a rubber O-ring 324 in watertight sealing engagement with the bore 310 of the support member 300. The sealing means 312 comprises a flange 326 having an annular cross section which extends from the outer periphery of the

compression ring 322 proximally along the inner surface of the bore 310 to the opening 320. The flange 326 comprises a lip 328 at its proximal end which extends partially across the upper surface 330 of the support member 300.

- 5 The compression ring 322 and the flange 326 of the first sealing means form a cup shape in which is disposed, in use, the second sealing means 314. Accordingly, the second sealing means 314 is completely shielded from the inner surface of the bore 310 by the first sealing means 312 (in particular, the flange 326 of the first sealing means 312).
- 10 The second sealing means 314 also comprises an annular compression ring 332, which is configured to maintain a rubber O-ring 334 in watertight engagement with the rod 304. The O-ring 334 also provides a watertight seal between the first and second compression rings 312, 314, in use. The sealing means comprises a notch 336 which extends around an outer periphery of the compression ring 332.

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As illustrated in Figures 4A and 4B, the first and second sealing means may be removed as follows.

- Firstly the blade of a screwdriver 317, or an equivalent tool, is inserted into the notch
- 20 336 of the second sealing means 314. The blade is prevented from coming into contact with the inner surface of the bore, by virtue of the flange 326 of the first sealing means 312. The blade is then utilised to prise the second sealing means 314 from its location within the first sealing means 312. The notch 336 is adapted to receive the blade, or equivalent tool, such that extraction of the second sealing means 314 may be achieved
- 25 without damaging either of the compression rings 322, 332, or the bore 310.

- Once the second sealing means 314 has been removed (or even if it has not) the first sealing means 312 may be removed from the bore 310. The blade of the screwdriver 317, or the equivalent tool, is inserted between the lip 328 of the flange and the upper
- 30 surface 330 of the support member 300. The blade need not be inserted within the bore or come into contact with the inner surface of the bore to remove the first sealing means.

Figures 5 and 6 illustrate second and third alternative embodiments of the invention. The support members of these embodiments are identical to that of the first embodiment, and like numerals have been used to indicate equivalent components.

- 5 As illustrated in Figure 5, the first and second (upper and lower, respectively) sealing means 512, 514 of the second embodiment of the invention are positioned within the support member 500, in use. In this position, the sealing means are disposed within the bore distal of the opening 520 of the bore 510. However, contrary to the first embodiment, the first sealing means 512 is proximal of the second sealing means 514.

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- As with the first embodiment, the first and second sealing means 512, 514 each have a compression ring 322, 332. The compression ring 522 of the first sealing means 512 is configured to maintain a rubber O-ring in watertight sealing engagement with the bore 510 of the support member 500 and the compression ring 532 is configured to maintain a
15 rubber O-ring in watertight sealing engagement with the rod 504.

- The first sealing means 512 comprises a flange having an annular cross section and which extends from an outer periphery of the compression ring 522. The flange forms a lip 526 which extends partially across the upper face 530 of the support member 500, in
20 use. The second compression means comprises a flange 528 which has an annular cross section and which extends from an inner periphery of the compression ring 532 proximally along the rod 504 to the opening. The proximal end of the flange comprises a notch 536.

- 25 The cap has been modified such that it is configured to bear down upon the first sealing means 512, which, in turn, bears down upon the second sealing means 514.

- Removal of the first and second sealing means is substantially as described in connection with the first embodiment, but with the following differences. The first sealing means is
30 removed by engaging the blade of a screwdriver, or the like, between the lip of the first sealing means and the upper face of the support member and prising the first sealing means from the bore, as described previously. The second sealing means is removed by engaging the blade with the notch of the second sealing means and prising the second

sealing means from the bore, as described previously. Alternatively, both first and second sealing means could be removed simultaneously by prising the second sealing means from the bore.

- 5 Figure 6 illustrates an embodiment of the invention which is similar to the first embodiment except for the arrangement of the O-rings. As illustrated, the first sealing means 612 comprises a compression ring 622 configured to maintain a rubber O-ring 624 in watertight sealing engagement with the bore 610 of the support member 600. The second sealing means 614 comprises a compression ring 632 configured to maintain first
10 and second rubber O-rings 634, 636 in watertight sealing engagement with the rod 604 and the first sealing means 614, respectively.

Of course, the arrangement of the O-rings illustrated in Figure 6 may be used in the second embodiments. Alternatively, the arrangement may be adapted in either
15 embodiment such that the first sealing means comprises first and second O-rings.

It will be appreciated that modifications may be made to the embodiment described without departing from the scope of the invention, as defined in the appended claims.

CLAIMS

1. An apparatus for providing a watertight seal between an earthing rod and a slab; the apparatus comprising:
 - a support member mountable on the slab, the support member having a surface and a bore extending through the support member from an opening at the surface;
 - a first annular sealing means for sealing against the bore; and
 - a second annular sealing means for sealing against the rod;wherein the first and second annular sealing means are disposed within the bore, in use, and wherein each sealing means is accessible from the surface of the support member when so disposed.
2. The apparatus of claim 1, wherein each sealing means comprises a compression ring and at least one O-ring.
3. The apparatus of claim 2, wherein a first O-ring of the first sealing means is arranged to provide a watertight seal between the compression ring of the first sealing means and the bore, and a first O-ring of the second sealing means is arranged to provide a water tight seal between the compression ring of the second sealing means and the rod.
4. The apparatus of claim 2 or claim 3, wherein the bore has a proximal end adjacent the opening and the compression rings of the first and second sealing means are, in use, disposed distally of the proximal end.
5. The apparatus of claim 4, wherein the compression ring of the first sealing means is, in use, disposed distally of the compression ring of the second sealing means.
6. The apparatus of claim 4, wherein the compression ring of the first sealing means is, in use, disposed proximally of the compression ring of the second sealing means.
7. The apparatus of any one of claims 3 to 5, wherein the first O-ring of the second sealing means is arranged to provide a watertight seal between the first and second compression rings.
8. The apparatus of any one of claims 3, 4 or 6, wherein the first O-ring of the first sealing means is arranged to provide a watertight seal between the first and second compression rings.

9. The apparatus of claim 3, wherein one of the first sealing means and the second sealing means comprises a second O-ring, the second O-ring arranged to provide a watertight seal between the first and second compression rings.
10. The apparatus of any preceding claim, wherein one or more of the first and second sealing means comprises a flange adapted to facilitate engagement with said one or more sealing means, the flange extending, in use, to a location adjacent the opening.
11. The apparatus of any preceding claim, wherein one or more of the first and second sealing means comprises a notch adapted to facilitate engagement with said one or more sealing means, the notch positioned, in use, at a location adjacent the opening.
12. The apparatus of claim 11, when dependent on claim 10, wherein the first sealing means comprises a flange and the second sealing means comprises a notch.
13. The apparatus of claim 11, when dependent on claim 10, wherein the first sealing means comprises a notch and the second sealing means comprises a flange.