

SEALING GASKET

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Field of the invention

This invention relates to dealing gaskets and refers particularly, though not exclusively, to sealing gaskets used in the sealing of joints of two adjacent structural components.

Background to the invention

When joining two adjacent structural components such as, for example, a tunnel, it is normal to use a gasket or seal at the join of the two structural components to prevent, or at least minimise, water leakage.

In US patent 5,888,023 there is shown such a seal. However, the seal illustrated in the patent has difficulties associated with its use such that it has not achieved full commercial success.

It is therefore the principal object of the present invention to provide a sealing gasket, particularly for sealing of joints of two adjacent structural components, that addresses some or all of the difficulties found in prior art products.

Summary of the invention

With the above and other objects in mind, the present invention provides gasket for providing a seal between a first structural component

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and second structural component, the gasket being locatable a recess in the first structural component, the recess having side walls and a base, the gasket including a lower surface having at least one protuberance thereon to, in use, sealingly engage the base; generally planar upper surface parallel to and spaced from the lower surface; and sidewalls extending upwardly between the lower surface and the upper surface and having biased outwardly intermediate their length. There is also a void extending longitudinally of the gasket and being located between but not contacting the upper surface, the lower surface, and the sidewalls.

Preferably, the void is generally ovular in shape and has a top, a bottom and two generally semicircular ends. The sidewalls may have a lower sidewall extending upwardly and outwardly from the lower surface, and upper sidewalls extending upwardly and inwardly from the lower sidewalls.

The at least one protuberance may be in the form of a saw-tooth formation, a wave-form formation, or a scalloped formation.

It is preferred that the lower side walls have a lower vertical height substantially the same as an upper vertical height of the upper side walls, and they may extend upwardly and outwardly at a lower angle in the range of 5° to 30° to the vertical, preferably 15°.

The upper walls were extended upwardly and inwardly at an upper angle in the range of 5° to 30° to the vertical, preferably 15°.

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Advantageously, the upper surface has a recess therein proximate the centre of its length, the recess being undercut to provide at least one projection extending laterally into an upper end of the recess. Preferably there is provided an internal gasket in the recess, the internal gasket preferably being hydrophilic. The internal gasket and/or the recess may be of any suitable shape such as, for example, polygonal, trapezoidal, rectangular, or circular. The recess and the gasket may be of the same height.

The top may be convex and extended into the void, wherein the distance between the top and the upper surface is substantially the same as the vertical height of the at least one protuberance. This creates a void which is substantially bilobular.

The internal gasket may have a head which may be coplanar with the upper surface, or may extend above the upper surface.

The gasket is preferably made of a material having a hardness in the range of 60 to 70 shore A, and the void may be filled with a material having a hardness in the range of 20 to 30 shore A.

Description of drawings

In order that the invention may be fully understood and put into practical effect there shall now be described by way of non-limitative example only preferred constructions of sealing gaskets incorporating the

principal features of the present invention, the description being with reference to the accompanying illustrative drawings in which:

Figure 1 is a vertical cross-sectional view of a first embodiment;

Figure 2 is a vertical cross-sectional view of a second embodiment;

Figure 3 is a vertical cross-sectional view of a third embodiment; and

Figure 4 is a vertical cross-sectional view of a fourth embodiment.

Description of preferred embodiments

Throughout the drawings reference to like components uses like reference numerals with a prefix number designating the embodiment concerned.

To refer to Figure 1, there is shown a sealing gasket adapted to be received in a recess (not shown) in a structural component (not shown). The structural component may be a pipe, a large diameter pipe, a drain, a culvert, or a tunnel.

The gasket is adapted to seal with not only the recess in which it is located, but also with either a similar gasket in a similar recess in a second structural component.

The gasket has a lower surface 110 which is of a saw-tooth or wave form configuration to enable it to provide an effective seal with the bottom of the recess in which it is to be located. Alternatively, the lower surface 110 may be generally planar with a number of longitudinally extending ribs to

locate on the bottom of the recess. Further alternatively, the lower surface 110 may be of a scalloped formation.

By having a series of saw-teeth, waves or scallops the gasket is more compressible and can tolerate higher compressive forces.

The lower sides 112 of gasket are a mirror image of each other and extend not only upwardly from lower surface 110, but also outwardly at an angle which approximates that of the angle off the side walls of the recess in which the gasket is to be located. That angle may be in the range of 5° to 30° to the vertical, but is preferably 15° to the vertical.

The upper sides 114 are the reverse of the lower sides 112 and are angled inwardly, preferably by the same angle as that of the lower sides 114 – in the range of 5° to 30° to the vertical, but preferably 15° to the vertical. However, the angles may be different, if desired.

The vertical height of the lower sides 112 is preferably the same as the vertical height of the upper sides 114 such that the line of the junction 116 of sides 112, 114 is at the mid-point in height of the gasket.

The gasket has an upper surface 118 which is generally planar, although it may have at least one longitudinally extending rib, if desired.

There is a void 120 in the gasket extending for the entire length of the gasket. If desired, plugs (not shown) may be used to seal the void 120 closed at each end of the gasket. Alternatively, and preferably, it may be joined end to-end with a vulcanized rubber joint; gluing; or the like. The void 120 is preferably ovular in shape and has a top 122, bottom 124, and semi-

circular ends 126. This distance between upper surface 118 and top 122 may be substantially the same as the vertical height of the saw-tooth formation of lower surface 110. The void 120 is either left hollow, or filled with a material which is less dense, or less hard, or more flexible than the material of the remainder of the gasket. By way of example only, the gasket may be made of a hard rubber elastomer having a hardness in the range of 60 to 70 shore A, and the void 120 may be filled with a sponge rubber elastomer having a hardness in the range of 20 to 30 shore A.

In this way the gasket has the necessary flexibility, deformability and rigidity to fulfil its functional requirements yet is lighter in weight and/or more flexible than prior art gaskets performing a similar function. By having sides 112, 114 angled outwardly, they are biased outwardly so that when a compressive force is applied on upper surface 118, sides 112, 114 will flex outwardly to thus increase the seal with the sides of the recess in which the gasket is located.

The gasket of Figure 2 is identical to that of Figure 1 except that the upper surface 218 has a recess 228 therein proximate the centre of its length. The recess 228 is slightly undercut to provide small projections 230 extending into the upper end 232 of recess 228. Located in recess 228 and releasably retained therein by projections 230 is an internal gasket 234. Internal gasket 234 is preferably a hydrophilic gasket, which causes it to expand to up to at least 4 or 5 times its normal volume, preferably up to 10 times its normal volume, upon coming into contact with water. Therefore, if

for any reason water reaches internal gasket 234 it will expand. Due to the hardness of the gasket, the internal gasket 234 will fill recess 228 and expand upwardly between projections 230 and thus extend beyond the upper surface 218. This will then assist the sealing action of the gasket to prevent water ingress beyond internal gasket 234.

To allow for the depth of the recess 228, top 222 is preferably made convex so that it extends into void 220. Ends 226 therefore become more than semicircular, although bottom 224 is unchanged. This creates lobes 236 at each end of void 220 such that void 220 is bilobular.

The material of internal gasket 234 may be any suitable hydrophilic material such as, for example, a polyurethane and natural rubber blend; or a bituminous compound.

Figure 3 shows a variation of the embodiment of Figure 2 where lower surface 310 is scalloped; and recess 328 is trapezoidal. In this way projections 330 are integrated into the gasket. Internal gasket 334 is also trapezoidal and fills recess 328. It is of the same height as recess 328. The internal gasket has a head 338 which is substantially co-planar with (or flush with) upper surface 318.

Figure 4 is a variation of Figure 3, where recess 428 is in the shape of a major segment of a circle, preferably with a flattened base 440. Internal gasket 434 is of circular shape and has a crown 438 which may be substantially co-planar with upper surface 418 or, preferably, extends upwardly beyond upper surface 418. It is also preferred that internal gasket

substantially fills recess 428 so that upon a compressive force being applied to internal gasket 434 it will fill recess 428.

Furthermore, by having internal gasket 434 above upper surface 418, water will contact internal gasket 434 somewhat earlier thus allowing it to commence to expand earlier, thus allowing it to fulfill its function earlier.

Whilst there has been described in the foregoing description preferred constructions of a gasket incorporating the principal features of the present invention, it will be understood by those skilled in the technology that many variations or modifications may be made without departing from the present invention.

The claims:

1. A gasket for providing a seal between a first structural component and a second structural component, the gasket being located in a recess in the first structural component, the recess having side walls and a base, the gasket being made of a material and includes:
 - (a) a lower surface have at least one protuberance thereon to, in use, sealingly engage the base;
 - (b) a generally planar upper surface parallel to and spaced from the lower surface; and
 - (c) sidewalls extending upwardly between the lower and upper surfaces, and being biased outwardly intermediate their height; and
 - (d) a void extending longitudinally of the gasket and being located between but not contacting the upper surface, the lower surface, and the sidewalls, the void being filled with a different material that is less dense than the material of the gasket.
2. A gasket as claimed in claim 1, wherein the side walls have lower sidewalls extending upwardly and outwardly from the lower surface, and upper sidewalls extending upwardly and inwardly from the lower sidewalls.
3. A gasket as claimed in claim 1 or claim 2, wherein the void is generally ovular in shape and has a top, a bottom and two generally semicircular ends.
4. A gasket as claimed in any one of claims 1 to 3, wherein the at least one protuberance in the form of a saw-tooth formation.

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5. A gasket as claimed in any one of claims 1 to 3, wherein the at least one protuberance is in the form of a wave-form formation.
6. A gasket as claimed in any one of claims 1 to 3, wherein the at least one protuberance is in the form of a scalloped formation.
7. A gasket as claimed in anyone of claims 2 to 6, wherein the lower sidewalls have a lower vertical height substantially the same as an upper vertical height of the upper sidewalls.
8. A gasket as claimed in any one of claims 2 to 7, wherein the lower sidewalls extend upwardly and outwardly at a lower angle in the range of 5° to 30° to the vertical.
9. A gasket as claimed in claim 8, wherein the lower angle is 15° .
10. A gasket as claimed in any one of claims 1 to 9, wherein the upper walls extend upwardly and inwardly at an upper angle in the range of 5° to 30° to the vertical.
11. A gasket as claimed in claim 10, wherein the upper angle is 15° .
12. A gasket as claimed in any one of claims 1 to 11, wherein the upper surface has a recess therein proximate the centre of its length, the recess being undercut to provide at least one projection extending laterally into an upper end of the recess.
13. A gasket as claimed in claim 12, wherein there is provided an internal gasket in the recess.
14. A gasket as claimed in claim 13, wherein the internal gasket is hydrophilic.

15. A gasket as claimed in any ¹¹ one of claims 12 to 14, wherein the top of the void is convex and extends into the void.
16. A gasket as claimed in claim 15, wherein the void is bilobular.
17. A gasket as claimed in any one of claims 1 to 16, wherein the distance between the top of the void and the upper surface is substantially the same as the vertical height of the at least one protuberance.
18. A gasket as claimed in any one of claims 1 to 17, wherein the gasket is made of a material having a hardness in the range of 60 to 70 shore A.
19. A gasket as claimed in any one of, claims 1 to 17, wherein the different material in the void has a hardness in the range 20 to 30 shore A.
20. A gasket as claimed in any one of claims 13 to 19, wherein the internal gasket is polygonal in cross-sectional shape.
21. A gasket as claimed in claim 20, wherein the polygonal shape is trapezoidal.
22. A gasket as claimed in claim 20, wherein the polygonal shape is rectangular.
23. A gasket as claimed in any one of claims 13 to 19, wherein the internal gasket is circular in cross-sectional shape.
24. A gasket as claimed in any one of claims 13 to 23, wherein the recess and the internal gasket are of the same vertical height.

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25. A gasket as claimed in claim 23, wherein the internal gasket has a head which is co-planar with the upper surface.

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26. A gasket as claimed in claimed in any one of claims 13 to 23, wherein the internal gasket has a crown which extends upwardly beyond the upper surface.
27. A gasket as claimed in any one of claims 12 to 26, wherein the recess is polygonal.
28. A gasket as claimed in claim 27, wherein the recess is trapezoidal.
29. A gasket as claimed in claim 27, wherein the recess is rectangular.
30. A gasket as claimed in any one of claims 12 to 26, wherein the recess has a shape of a major segment of a circle.
31. A recess as claimed in claim 30, wherein the recess has a flattened base.