

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
12 April 2012 (12.04.2012)

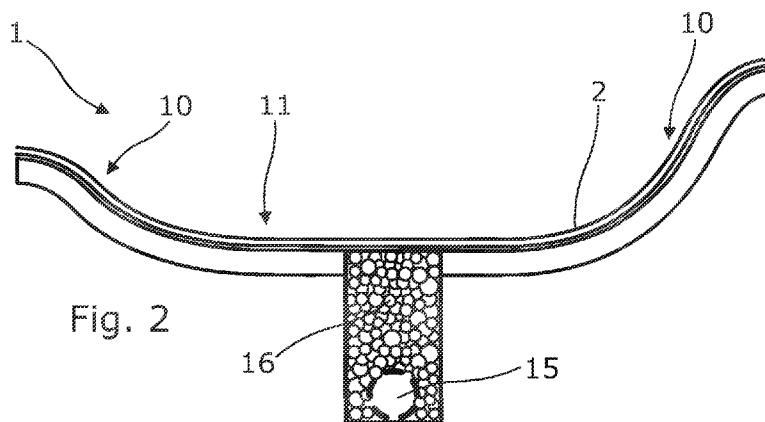
(10) International Publication Number  
**WO 2012/046014 A1**

- (51) **International Patent Classification:**  
*E01C 13/02* (2006.01)    *A63C 19/00* (2006.01)  
*C09K 17/00* (2006.01)
- (21) **International Application Number:**  
PCT/GB2011/051613
- (22) **International Filing Date:**  
26 August 2011 (26.08.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
1017013.2    8 October 2010 (08.10.2010)    GB
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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**  
— with international search report (Art. 21(3))

(54) **Title:** POROUS LAYER FOR A GOLF BUNKER



(57) **Abstract:** A porous base layer (2) for a golf bunker, the layer comprising granulate material held together by a binder, the layer arranged to receive sand atop said layer.

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## GOLF BUNKERS

### Technical Field

The present invention relates to golf bunkers.

### Background

5 Golf bunkers can be time-consuming and costly to maintain. We seek to provide an improved golf bunker, and in particular an improved golf bunker base.

### Summary

10 According to a first aspect of the invention there is provided a porous base layer for a golf bunker, the layer comprising granulate material held together by a binder, the layer arranged to receive sand atop said layer.

An upper surface of the base layer is preferably provided with a plurality of sand-retaining recesses.

15 The plurality of sand-retaining recesses preferably comprises a repeating pattern of recesses.

At least some of the sand-retaining recesses are preferably of substantially quadrilateral shape. Most preferably at least some of the sand-retaining recesses are of substantially rhombus or parallelogram shape.

20 Preferably the base layer comprises an inclined region. Preferably the sand-retaining recesses are provided on the inclined region.

Preferably the principal dimension of the granulate material forming the inclined region is in the range 6 to 10 mm.

Preferably the base layer defines a region which defines a lower region of the bunker. Preferably the principal dimension of the granulate material which forms the lower region is substantially in the range 2 to 4 mm.

- 5 Alternatively, both the inclined and lower regions may be formed using granulate material substantially in the range 2 to 4 mm.

Preferably the granulate material comprises rubber or plastic material, or a combination thereof. Most preferably the granulate material comprises recycled rubber.

- 10 Preferably the binder comprises a polyurethane resin.

According to a second aspect of the invention there is provided a golf bunker comprising the base layer of the first aspect of the invention.

- According to a third aspect of the invention there is provided a method of providing a base layer for the golf bunker of the second aspect of the  
15 invention.

### **Brief Description of the drawings**

Various embodiments of the invention will now be described, by way of example only, with reference to the following drawings in which:

**Figure 1** is a plan view of a golf bunker,

- 20 **Figure 2** is a cross-section on line A-A, and

**Figure 3** is a cross-section on line B-B

### Detailed Description

With reference to Figure 1, there is shown a golf bunker 1, which is substantially of overall dished shape. As will be described in more detail below, the bunker 1 comprises a base layer 2, which may be viewed as a liner or 'blinder', which supports a layer of sand. The layer 2 may be considered as a layer between drainage and the sand which has the capability to stop sand migrating through it into the drainage, hence inhibiting the drainage capacity of the bunker. The method of applying the base layer 2 is now described.

10 The bunker 1 is provided with a drainage system comprising an underlying drainage conduit 15, set within an aggregate 16.

Before the base layer 2 can be applied, a firm sub-base 3, typically of consolidated material is prepared. It will be appreciated, however, that the base layer 2 could be applied to a sub-soil, chalk or existing stone surface.

The bunker 1 may be described as having two principal regions. The first is an inclined region 10, the maximum incline of which is approximately 60%. The second region is a relatively flat region 11, which is surrounded by the inclined region 10.

20 The material for the base layer 2 generally comprises granulate material in the form of angular rubber pieces, preferably of recycled rubber, combined with a binding agent. A slightly different composition of the base layer material is used for each of the inclined region 10 and the flat region 11.

25 In preparing the composition for the flat region 11, a pan mixer is used to combine rubber granulate and the binder, in this case a polyurethane

resin. The binder forming between 10% to 20% of the overall composition. The principal dimension of the particulate material (for example largest dimension of the particles which provides a meaningful indication of the size of the particle) is substantially in the range 2mm to 4 mm. The binder and the granulate are combined by the mixer so as to coat the granulate with the binder such that the composition is in the form of a wet-pour rubber. The granulate composition is then applied to the flat region 10 in a layer in the range of around 15 to 50 mm depth. The bonding between the granulate by the binder is such that voids/gaps/pores remain (where the particles are not directly connected) so as to allow for drainage of water through the layer.

Preparation of the composition for the inclined region 11 is substantially as described above, save for two main differences. Firstly, the principal dimension of the granulate material is substantially in the range 6 to 10 mm. Secondly, after application of the composition to the sub-base, a pattern of sand-retaining recesses is created in the upper surface of the layer. An example of the shape of such recesses is shown in Figure 1 at 20. As is evident the recesses are of substantially quadrilateral shape. The recesses are formed by way of a roller of which the operative surface is formed with a relief so as apply the recess pattern to the layer (whilst the binder is still in an uncured, formable, condition). As the roller is applied to the layer, the weight of the roller forms indentations in the layer. The recesses may alternatively be created by way of a manually operable stamp or press.

The sand-retaining recesses advantageously ensure excellent retention of sand thereon. The particles being in the range 6 to 10 mm, means that some of the sand will sit in the pores of the base layer 2, which further assists in retaining the sand on the inclined region 10. Furthermore, the

particle size range creates a higher critical tension in the sand (sand holds onto more water due to differences between particle size of sand in comparison to the particle size range), the particle size range is also less likely to bounce a ball out of the bunker on impact because it absorbs the energy of the ball striking the bunker face.

The particle size range of 2 to 4 mm used for the relatively flat region 11, also has excellent drainage properties, but has a lower critical tension (holds less water in the sand, due to particle size of sand and rubber being closer together making the water migrate through the sand and the rubber, making a drier sand to play from).

Due to the materials used for the layer 2, the layer is inherently flexible, and so can withstand the expansion and contraction of soils. Also, if required, the layer 2 can easily be removed.

Use of the layer 2 advantageously results in increased bunker longevity, significantly reducing the man-hours required for maintenance. In particular, the layer 2 better protects the drainage medium, vastly extending the drainage replacement program. The layer 2 also ensures that there is minimum contamination to the sand, creating significant savings in sand replacement. The layer 2 further ensures that there is minimum wash from bunker faces. The layer 2, being resilient in nature, substantially eliminates golf club damage. If a portion of liner becomes detached from the main body, the risk of damage to mowing equipment passing over detached portion is reduced.

Although the above description particular mention is made of rubber granulate, in addition or alternatively, plastic granulate may be employed.

5 The granular rubber and/or granular plastic may be mixed with aggregate or asphalt, and a binding agent. Or indeed, the granulate may solely or principally comprise particulate such as aggregate, such as stones.

Preparation of the liner material may be effected as a cold mix process or as a hot mix process. In a cold mix process the binding agent is added to the granulate (including any aggregate and/or asphalt). In a hot mix  
10 process, a mixture of binding agent and granulate (including any aggregate and/or asphalt) are heated and then applied in a process similar to that of laying asphalt (for example to a sub-base of a road of vehicle carriageway).

15 The term granular includes, but is not limited to, particles formed by way of a shredding process. So, for example, one could envisage using shredded rubber and/or shredded plastic.

## CLAIMS

1. A porous base layer for a golf bunker, the layer comprising granulate material held together by a binder, the layer arranged to receive sand atop said layer.
- 5 2. A base layer as claimed in claim 1 in which an upper surface of the base layer is provided with a plurality of sand-retaining recesses.
3. A base layer as claimed in claim 2 in which the plurality of sand-retaining recesses preferably comprises a repeating pattern of recesses.
4. A base layer as claimed in either of claims 2 or 3 in which at least  
10 some of the sand-retaining recesses are of substantially quadrilateral shape.
5. A base layer as claimed in claim 4 in which at least some of the sand-retaining recesses are of substantially rhombus or parallelogram shape.
- 15 6. A base layer as claimed in any preceding claim which comprises an inclined region.
7. A base layer as claimed in claim 6, when appended to claim 2, in which the sand-retaining recesses are provided on the inclined region.
8. A base layer as claimed in claim 6 in which the principal dimension  
20 of the granulate material forming the inclined region is in the range 6 to 10 mm.



9. A base layer as claimed in any preceding claim which includes a region which defines a lower region of the bunker.
10. A base layer as claimed in claim 9 in which the principal dimension of the granulate material which forms the lower region is substantially in the range 2mm to 4 mm.
11. A base layer as claimed in claim 6 and claim 9 in which both the inclined and lower regions are formed using granulate material of which the principal dimension is substantially in the range 2 to 4 mm.
12. A base layer as claimed in any preceding claim in which the granulate material comprises rubber or plastics material, or a combination thereof.
13. A base layer as claimed in claim 12 in which the granulate material comprises recycled rubber.
14. A base layer as claimed in any preceding claim in which the binder comprises a polyurethane resin.
15. A base layer as claimed in any preceding claim which comprises aggregate.
16. A base layer as claimed in any preceding claim which comprises asphalt.
17. A base layer as claimed in any preceding claim in which the principal dimension of the granular material is 0.1mm to 10mm.
18. A golf bunker comprising the base layer of any of claims 1 to 16.

19. A method of providing a base layer for a golf bunker comprising providing a base layer as claimed in any of claims 1 to 17.

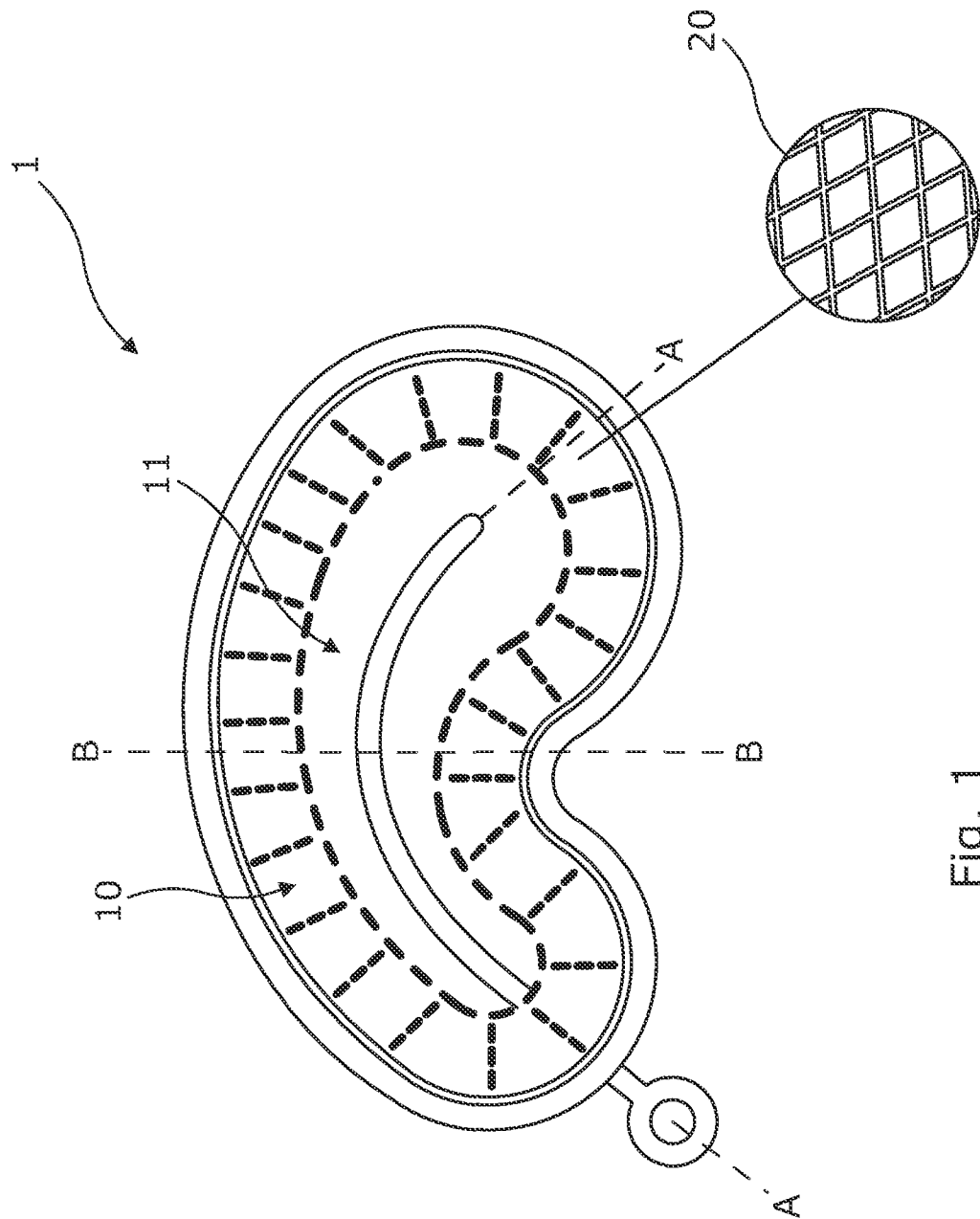


Fig. 1

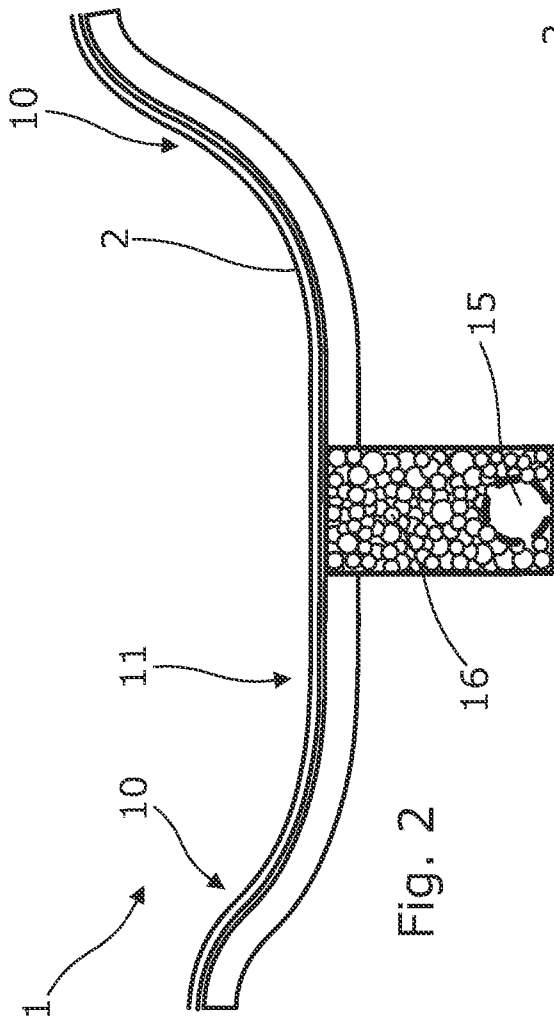


Fig. 2

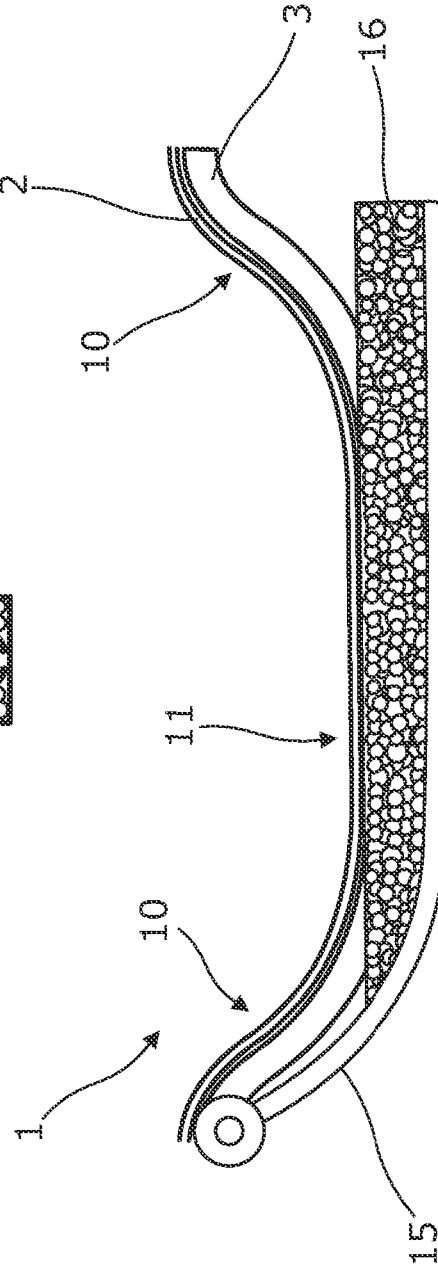


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2011/051613

A. CLASSIFICATION OF SUBJECT MATTER  
INV. E01C13/02 C09K17/00 A63C19/00  
ADD.  
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED  
Minimum documentation searched (classification system followed by classification symbols)  
E01C C09K E02D A63C

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 practical, search terms used)  
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97/27368 A1 (STABILIZER INC [US]; HUBBS JONATHAN W [US]; HUBBS JAMES J JR [US]) 31 July 1997 (1997-07-31) page 5 - page 7; figures	1,6, 8-11, 15-19 2-5,7
Y	----- US 2007/278142 A1 (CLARK KEVIN L [US]) 6 December 2007 (2007-12-06) paragraph [0031] - paragraph [0034]; figures	2-5,7
Y	----- WO 01/05257 A1 (U S GREENTECH INC [US]; JONES JAMES MARTIN [US]) 25 January 2001 (2001-01-25) page 4 - page 6; figures ----- -/--	3-5,7

Further documents are listed in the continuation of Box C.

See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search  13 October 2011	Date of mailing of the international search report  21/10/2011
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Lundblad, Hampus
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2011/051613

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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