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(54) **Sealing member**

(57) The invention relates to a sealing member intended for sealing conical holes in concrete structures, caused by the use of spacers for maintaining a mutual distance between formwork parts, said sealing member consisting at least partly of a rock-like material and part-

ly of a resilient material, and in which the resilient material is formed by cork particles being incorporated in a matrix of rock-like material with an at least partly open structure.

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Description

[0001] The present invention relates to a sealing member, intended for sealing holes in concrete structures or concrete elements caused by the use of spacers for maintaining a mutual distance between formwork parts employed therein, said sealing member having an at least partly conical shape.

[0002] Such sealing members are known per se in the field of construction and have a specific conical shape corresponding to the conical shape of the spacers employed. The spacers have a conical shape for enabling easy removal thereof from the at least partly hardened concrete. However, the conical shape of a sealing member also requires that measures must be taken in order to make sure that the sealing members will remain in place, even after years. Now it has been known to provide a sealing member made entirely of compressed concrete, which should be mounted into an opening with the help of an adhesive. Apart from the fact that this is laborious and thus time-consuming, such a sealing member also requires a large amount of adhesive.

[0003] Another known sealing member comprises a core of a rock-like material having a jacket of a plastic foam, such as e.g. polystyrene, around it. Such a sealing member is forcibly inserted into a opening with the help of e.g. a striking tool. The final retaining of said sealing member in the opening is established by the deforming and resilience of the polystyrene jacket. However, the resilience of polystyrene and comparable plastics is relatively small, and furthermore decreases in time, due to which a permanent retention of such a sealing member in a conical hole can not be guaranteed.

[0004] A further disadvantage of such sealing members having a jacket of polystyrene or other plastic is that they have a laterally protruding collar at their wide end due to the manufacturing process. On driving the sealing members in said collar will come loose from the sealing members. Although the amount of material per sealing member seems mostly too insignificant to pick up, this will ultimately lead to a large amount of practically non-degradable drifting waste.

[0005] Therefore, the object of the invention is to remove such disadvantages and to provide a sealing member which can be durably and fixedly mounted without difficulty and furthermore can be manufactured relatively simply.

[0006] Accordingly, the invention provides for that the sealing member has an at least partly conical shape and consists at least partly of a rock-like material and partly of a resilient material, said resilient material being incorporated in the matrix of the rock-like material.

[0007] According to a further elaboration, it is further provided for, that the rock-like material is formed of a mortar with cement and sand and that the resilient material consists of cork particles incorporated in the mortar. The underlying idea is to use the natural resilience of cork, which, as opposed to the resilience of plastic

foam materials, such as e.g. polystyrene, does have an extremely durable character. Here, according to the invention it is provided for, that at least in its edge portion, the structure of the sealing member is open and as consequently deformable to such a degree, that on driving in a sealing member according to the invention, the matrix in the edge portion will partly collapse and the cork particles embedded in that part of the matrix can provide for an elastic clamping of the sealing member against the wall of the conical hole to be sealed.

[0008] Furthermore, other important advantages are obtained with the sealing member according to the invention. All required components can be brought into e.g. a concrete mixer or similar device in the appropriate proportions, be mixed and subsequently be prepared with the proper amount of water into a directly processable mortar in one working stage. Thus, producing a jacket or other constituent separately and and combining it with a rock-like complementary part of the sealing member later is not necessary.

[0009] A further advantage is that the resilient material to be used is a relatively cheap natural product which is easily obtainable in a furthermore immediately processable, granular form. Here, another important advantage of the natural product of cork must be mentioned, namely that it is a biodegradable material. This provides for, that the sealing member according to the invention, as opposed to said known sealing member having a jacket of plastic foam material, can be applied in a so-called "durable building" project, in which the object is limiting the burden of building activities for man and environment as much as possible.

[0010] Of particularly great importance is the reduction in weight resulting from a sealing member according to the invention. Of course, this reduction in weight depend directly on the amount of granular cork used per sealing member and is especially important when transporting said sealing members.

[0011] With a load of sealing members, usually the weight of the sealing members is decisive for the maximum transportable load per truck, and not the total transport volume of the truck to be used. With an easily achievable weight reduction of 35 % the number of sealing members with a load based on weight will be more than 150 % of the number of original sealing members of compressed concrete. It will be obvious, that apart from an advantage in costs, a logistic advantage is achieved as well. Besides, on the building site the reduced weight of the sealing members delivered per unit is an important factor for the people who have to work with them.

In order to be able to provide for, that a sealing member according to the invention can always easily and actually fixedly be mounted in an opening, it is very important that the various parameters of the mortar are within certain ranges.

[0012] Firstly, it is important that the cork particles are located in a matrix having a structure not completely

closed. For clamping, it is essential that at least the outer part of the sealing member can collapse on clamping, as a result of which the cork particles largely determine the contact surface between the sealing member and the wall of the opening. Therefore, according to the invention, it is provided for that the ratio between cement and water is within a predetermined range, namely 1:1,4 - 1:1,6 in volume parts, and preferably around 1:1,5.

[0013] Further, the size of the cork particles and also the applied amount of cork particles is largely decisive for the proper clamping of the sealing member. Preferably, one uses cork obtainable in granular form, in which the particles should not be larger than 6 mm. However, according to a further elaboration, one preferably uses cork particles having a size varying from 1 - 4 mm.

[0014] It is decisive for the amount of cork particles that on one hand there should be sufficient cork particles in the matrix in order to be able to realize a sufficiently large elastic clamping force between sealing member and opening. On the other hand, the amount of cork particles should not be so large that on inserting a sealing member into a conical hole with force there is a change that the complete sealing member might collapse.

[0015] In testing arrangements, a large number of experiments have been carried out with various compositions of the sealing member. In experiments with relatively small amounts of cork particles, a sealing member having the following composition was prepared:

	Volume parts
Cement	0.130
Sand	0.571
Cork	0.102
Water	0.197
TOTAL	1.000

[0016] This composition already demonstrated the effect of the cork. However, experimenting with such a relatively small amount of cork particles is not particularly interesting, since a much better effect can be obtained with a larger amount, and further, a larger weight reduction can be obtained. The next Table indicates the weight reduction for a sealing member of the composition indicated above, in relation to a sealing member of compressed concrete.

Mass	2112 kg/m ³
Weight reduction	10 %

[0017] Experiments with a sealing member of a composition as given in the next Table have proven to realize a very good clamping of the sealing member in an opening, in which furthermore the sealing member can still largely withstand the mechanical forces exerted on it

when it is driven into a conical hole.

	Volume parts
Cement	0.088
Sand	0.384
Cork	0.395
Water	0.133
TOTAL	1.000

[0018] With a sealing member of this composition, the following weight reduction is achieved in relation to the standard sealing member indicated above.

Mass	1461 kg/m ³
Weight reduction	38 %

[0019] A weight reduction of 38 % means that, starting from a fixed loading capacity of a truck, that now a number of sealing members can be transported which equals 160 % of the number of standard sealing members.

[0020] Experiments with larger amounts of cork have shown that the amount can be chosen even considerably larger. However, when doing so, the mechanical strength of the sealing member will quickly decrease, as a result of which the risk of failure by fracture both during transport and on mounting gets extremely high.

[0021] Experiments with larger amounts of cork particles have shown that a sealing member of a composition as indicated in the following Table can still be applied.

	Volume parts
Cement	0.057
Sand	0.252
Cork	0.604
Water	0.087
TOTAL	1.000

[0022] Here, the weight reduction stated in the following Table is achieved.

Mass	998 kg/m ³
Weight reduction	58 %

[0023] A weight reduction of 58 % means, starting from a fixed loading capacity of a truck, that now a number of sealing members can be transported, which is 238% of the number of standard sealing members. However, the risk of failure by fracture is considerably higher in a sealing member of this composition.

[0024] The invention further provides for a method of manufacturing sealing members according to the invention, comprising at least the steps of:

- mixing sand, cement and cork particles in predetermined proportions; 5
- mixing with a predetermined amount of water, in which additives are added or not;
- bringing the mixed mortar into a container having one or more moulds for a sealing member. Next, the container having one or more moulds for a sealing member should be vibrated for a predetermined amount of time. 10

The moulds have the desired conical shape with a straight end plane and a predetermined length, in which, however, the sealing member is made with a slight overmeasure. This means, that with a sealing member manufactured in a certain length, it will remain protruding from the hole across 1 to 2 cm after insertion without force. Subsequently, the sealing member must be forcibly driven into the conical hole across the remaining length, in which the desired effect is achieved. 15

Claims

1. Sealing member intended for sealing holes in concrete structures or concrete elements caused by the use of spacers for maintaining a mutual distance between formwork parts, said sealing member having an at least partly conical shape and consisting at least partly of a rock-like material and partly of a resilient material. 30
2. Sealing member according to claim 1, **characterized in that** the resilient material is incorporated in a matrix of rock-like material. 35
3. Sealing member according to claim 2, **characterized in that** the rock-like material is formed of a mortar with cement and sand and that the resilient material consists of cork particles incorporated in the mortar. 40
4. Sealing member according to claim 3, **characterized in that** it is made of a relatively dry mortar, with a ratio of volume parts between cement and water of 1:1,4 - 1:1,6. 45
5. Sealing member according to claim 4, **characterized in that** preferably a ratio of 1:1,5 is maintained. 50
6. Sealing member according to claims 3 - 5, **characterized in that** cork particles having a maximum size of 6 mm are employed. 55
7. Sealing member according to claim 6, **character-**

ized in that the cork particles preferably have a size within the range of 1 - 4 mm.

8. Sealing member according to claims 2 - 7, **characterized in that** the volume percentage of cork particles in mixed mortar is 10 - 60 %.
9. Sealing member according to claim 8, **characterized in that** the volume percentage of cork particles in mixed mortar is preferably 35 - 45 %.
10. Method of manufacturing a sealing member according to one or more of claims 1 - 9, **characterized in that** it comprises at least the following steps:
 - mixing sand, cement and cork particles in predetermined proportions;
 - mixing with a predetermined amount of water, in which additives are added or not;
 - bringing the mixed mortar into a container having one or more moulds for a sealing member.
11. Method according to claim 10, **characterized in that** the container having one or more moulds for a sealing member is vibrated for a predetermined time.



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EUROPEAN SEARCH REPORT

Application Number
EP 01 20 4173

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	US 3 699 854 A (DOHERTY WALTER G) 24 October 1972 (1972-10-24) * column 2, line 56 - line 61 * * column 4, line 4 - line 30 * * figures *	1,2	E04G17/06
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			TECHNICAL FIELDS SEARCHED (Int.CI.7)
			E04G E04B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 January 2002	Examiner Andlauer, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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21-01-2002

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