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(54) **RETAINING ELEMENT, METHOD OF COATING A SUBSTRATE, AND THERMAL INSTALLATION**

VERANKERUNGSELEMENT, SUBSTRATENBEKLEIDUNGSVERFAHREN UND WÄRMEBEHANDLUNGSANLAGE

ELEMENT DE RETENUE, PROCEDE POUR REVETIR UN SUBSTRAT, ET INSTALLATION THERMIQUE

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(73) Proprietor: **Insulcon Europe B.V.**
3238 BK Zwartewaal (NL)

(72) Inventor: **VAN DER WAARD, Josephus, Johannes, Maria**
NL-3137 TH Vlaardingen (NL)

(74) Representative: **Jilderda, Anne Ayolt**
Octrooibureau LIOC B.V.,
Postbus 13363
3507 LJ Utrecht (NL)

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Description

[0001] The invention relates to a retaining element according to the first part of claim 1 (45.5 249 899 A). The invention also relates to a method of coating a substrate with a lining material, in which method the lining material is fastened by means of at least one retaining element. The invention also relates to a thermal installation.

[0002] A retaining element and a method of the kinds mentioned in the opening paragraph can be used to advantage in particular in thermal processes such as the internal linings of industrial furnaces, for example for the ceramic industry, and other thermal installations. Such furnaces are usually fitted with a heat-resistant, insulating inner wall in order to reduce the energy cost of operating such furnaces, and also for reasons of safety. Originally this wall consisted of a comparatively thick and heavy heat-accumulating lining in the form of refractory bricks, so-called castables, refractory preformed shapes, or refractory concrete. In recent years, however, the use of comparatively light-weight ceramic fibres has become widespread as a refractory lining material in practically all thermal processes such as, for example, process heaters, reformers, boilers, (ceramic) industrial furnaces, and central heating boilers as a replacement, fully or in part, of the hitherto usual refractory linings made of bricks, concrete, and the like. Initially these fibres were provided in the form of blankets in a layered structure, layer upon layer; subsequently the ceramic fibres were used more and more in the form of slacked strips or prefabricated blocks, so-called modules. The advantages of ceramic fibres as an insulation material are many. A lesser insulation thickness can suffice thanks to the higher insulation value, so that the capacity of the appliance is reduced to a lesser extent thereby. In addition, the smaller insulation thickness in combination with a considerably lower specific mass of fibre insulation, as compared with brick, concrete, castables, and refractory moulded pieces, leads to a major reduction in the installed weight of the appliance, so that the foundation and the (steel) construction for this can be made less heavy, and the entire assembly will have a considerably lower heat capacity. All this leads to substantially lower construction costs and shorter heating-up and cooling-down periods. It is hardly surprising, therefore, that ceramic fibre material is becoming more and more dominant nowadays as a heat-resistant thermal insulation material and as a material for refractory linings.

[0003] A ceramic fibre insulation, however, also has a disadvantage when applied, as is usual, in the form of a non-woven structure, i.e. an increased dust generation. It is inevitable in surroundings where the temperature changes strongly, such as in an industrial furnace, that tiny fibres detach themselves from the the insulation, fly about and settle as dust.

[0004] This is highly undesirable especially in ceramic furnaces where such fibres could settle in the glazing of the sanitary-ware or china under manufacture and would cause an increased rejection rate. It is equally desirable for health reasons to reduce the dust output of the insulation to a minimum, to protect the personnel who work in the production process. This led to the idea of covering the ceramic fibre insulation with a dustproof, low-dust fabric lining which will highly reduce any dust given off by the fibre insulation.

[0005] In a usual method of mounting such a fabric lining, holes are drilled in a large number of locations through the furnace casing and through the fibre substrate lying thereon. The lining is subsequently anchored with heat-resistant pins into the furnace casing in the holes thus provided therein, by means of welding or screwing. A ceramic pin screwed onto the heat-resistant pin at the hot side keeps the fabric in place by means of a retaining ring.

[0006] A disadvantage of such a lining is, however, that it is very expensive. Given a mounting pattern of 250 x 250 mm, no fewer than sixteen metal or ceramic anchor sets are required for each square metre of lining material in order to fix the latter durably to the substrate. The material and labour cost involved in this lead to a strong increase in the cost of the total insulation system used. Moreover, the anchor pins used in the known system constitute so-called heat bridges which will generally adversely affect the exterior temperature of the furnace.

[0007] The present invention has for its object to provide a retaining element and a method of the kinds mentioned in the opening paragraph with which a lining can be fixed to a substrate in a comparatively simple manner in such a way that the cost increase of a heat-resistant furnace insulation as referred to above, for example in the case described above, can be substantially eliminated.

[0008] To achieve the envisaged object, according to the invention, a retaining element of the kind mentioned in the opening paragraph wherein the elongated body comprises a cavity over at least part of its length, which cavity extends in axial direction has the features of claim 1, said cavity is open at least at a side facing the fastening member, and a wall of said body has at least one perforation at the area of the cavity, affording access to said cavity.

[0009] A method of the kind mentioned in the opening paragraph is for this purpose characterized in that such a retaining clement is used therein, in that the retaining element is introduced into the substrate through the lining material, in that a viscous compound is injected in an excess quantity into the cavity of the retaining element so as to cause this compound to flow out sideways into the substrate through the at least one perforation provided in said element, and in that subsequently the injected compound is cured. The material and labour cost of coating a substrate can be substantially reduced thanks to this method and the retaining elements according to the invention used therein. To protect the in-

sulation lining made of a ceramic fibre material of an industrial furnace with a dustproof, refractory fabric, according to the invention, the retaining elements according to the invention as described above are inserted through the lining into the substrate in a sufficient number of locations which have preferably been marked thereon beforehand. Then a viscous compound, in particular a paste-type suspension of aluminium oxide, is injected in an excess quantity into the cavities of the retaining elements such that the injected compound flows through the at least one perforation in the wall of the elongate body into the substrate. The retaining element can now still be comparatively easily pulled from the substrate. However, after the entire assembly has been subjected to a process step according to the invention wherein the injected compound is cured to hardness, for example a heat treatment of sufficiently high temperature in the case of a thermosetting paste, the compound which has flown out of the perforation and has been cured after that will provide an adequate retention, so that the lining will be permanently and securely attached to the substrate. Not only does this avoid the labour involved in the predrilling of holes in the furnace wall, as required in the usual method, but it also avoids heat bridges now that the retaining elements terminate in the insulation material and need not be fastened to any further (steel) wall situated behind it.

[0010] To facilitate the penetration of a retaining element into the substrate, a preferred embodiment of the invention is characterized in that the retaining element narrows towards its end situated opposite the fastening element, preferably ending in a point. Such a retaining element having a pointed end can be inserted into the substrate through the coating without any preparatory measures being necessary, especially in the case of a comparatively soft, compressible substrate material such as the ceramic fibre material described above and ditto lining. The work involved in making preparatory perforations or bores can thus be omitted.

[0011] To improve the final retention result, a special embodiment of the retaining element according to the invention is characterized in that the wall of the body comprises a number of separate perforations at the area of the cavity which are distributed over at least a major part of the length of the cavity. With such a retaining element, the paste can flow out radially from several perforations so as to achieve a fastening effect in the substrate in as many locations. To prevent a major portion of the compound injected into the cavity from flowing out through the first perforation encountered already, this special embodiment in a preferred embodiment of the invention is characterized in that the perforations increase in size in a direction from the fastening member to the opposite end. The increase in the size of the perforations in proportion as they lie farther removed from the base thus compensate partly for the extra flow resistance experienced by the paste as a result of the greater path length.

[0012] The fastening member, under which the lining is received and which eventually provides the fastening of the lining material to the substrate, may be constructed in various ways. In a special embodiment, however, the retaining element acording to the invention is characaterized in that the fastening member comprises a flange which is placed substantially transversely to the body and in which a bore is locally provided so as to afford access to the cavity inside the body. It was found in practice, especially in the case of a fabric lining, that such a circular-symmetrical fastening member results in a particularly homogeneous circumferential adhesion of the lining material to the substrate and accordingly in a particularly satisfactory end result.

[0013] Specially suited for application in industrial thermal processes, where high to very high temperatures sometimes prevail, is a further embodiment of the retaining element according to the invention which is characterized in that the retaining element is manufactured from a heat-resistant, for example ceramic, material, and more in particular, that it comprises mainly aluminium oxide. This results in a particularly permanent fastening system which can be specifically adapted to the desired degree of heat resistance.

[0014] According to the present invention, a thermal installation protected in this way and comprising a heatable space with an inner wall provided with a fibrous insulation layer is characterized in that the insulation layer is covered with an at least substantially dustproof cloth which is fastened thereto by means of a number of retaining elements according to the invention in a manner as defined in the invention, and in that the retaining elements are fixed in the insulation layer by means of extrusions of a compound which have been cured to hardness and which each project laterally from the cavity of a respective retaining element through a perforation in the wall thereof into the insulation layer.

[0015] Many heat-resistant materials, and especially ceramic materials, are of themselves comparatively hard, so that the processing thereof is comparatively expensive. In addition, the cost price is high already in many cases. A considerably more economical modification of the retaining element according to the invention is characterized in that the retaining element is manufactured from a synthetic material, and that slots are provided in the flange which extend through the full thickness of the flange and issue into the bore.

[0016] Many synthetic materials have a much lower cost price than, for example, metallic, ceramic or other heat-resistant materials, and also their processing is usually much simpler. It is thus possible to manufacture the retaining element in large numbers comparatively inexpensively, for example by means of injection moulding, if a suitable synthetic material is used, especially a synthetic material such as polythene which can be combusted in a harmless manner. Although the retaining element in this embodiment in itself is not heat-resistant, it is nevertheless suitable for applications where high to

very high temperatures can prevail. This is based on the recognition that the retaining element only has to fulfil a temporary function in the fastening system according to the invention. After the paste has been injected into the substrate through the element according to the invention and has been cured, the cured paste achieves the actual retention effect and the retaining element has become redundant in principle. During a first heating cycle of, for example, a furnace, a synthetic resin retaining element will melt away completely, whereas the refractory paste, which has become cured by that time, remains behind and maintains the fastening of the lining on the substrate. The slots in the flange also serve to receive some paste which, once cured, will subsequently provide a kind of flange and grip on the lining, so that also this function of the retaining element is taken over.

[0017] The invention will now be explained in more detail with reference to an embodiment and an accompanying drawing, in which:

Fig. 1	is a longitudinal sectional view of an embodiment of a retaining element according to the invention;
Figs. 2A and 2B	are rear elevations of two embodiments of the retaining element of Fig. 1; and
Figs. 3 to 5	show consecutive stages in the process of fastening a lining to a substrate in accordance with an embodiment of the method according to the invention.

[0018] The Figures are purely diagrammatic and not drawn true to scale. Some dimensions have been particularly exaggerated for reasons of clarity. Corresponding parts have been given the same reference numerals in the Figures as much as possible.

[0019] Fig. 1 shows an embodiment of a retaining element for fastening a lining material to a substrate. The retaining element comprises an elongate, substantially cylindrical body 1 which is designed for being accommodated in a substrate and into which a fastening member 2 merges. The fastening member in this embodiment is formed by a round flange with a diameter of approximately 50 mm in which locally a bore 3 of approximately 10 mm diameter has been provided.

[0020] The body 1 and the flange 2 in this example form one integral unit and are manufactured from a ceramic material, for example aluminium oxide.

[0021] The bore 3 affords acess to a cavity 5 which extends in axial direction in the body and which is indicated diagrammatically by means of a broken line in the Figure. Fig. 2A shows the body from the rear as viewed along the arrow in Fig. 1, so that this becomes more clearly apparent. The body 1 has a length of approximately 100 mm, and the cavity 5 extends over almost this entire length. The body 1 becomes narrower at its free end 6, even ending in a comparatively sharp point so as to facilitate a penetration of the body into the substrate.

[0022] The wall of the body 1 comprises a number of perforations 7 at the area of the cavity 5 which afford access to the cavity 5 transversely to the longitudinal direction (and which) are distributed over (the circumference) and along the longitudinal direction of the body. The perforations are formed here by through holes which extend over the full diameter of the body and accordingly result in perforations on either side of the body each time.

[0023] Consecutive holes have been provided at an angle to one another, transversely to one another in this case.

[0024] The retaining element described above is particularly suitable for application in ceramic furnaces and other, possibly industrial thermal processes where it is desired to cover a blanket of ceramic, non-woven insulation material in an at least substantially dustproof manner. The method to be followed in that case will now be explained in more detail with reference to Figs. 3 to 5.

[0025] Fig. 3 shows part of a, usually steel, shell of a thermal installation according to the invention, an industrial furnace in this case, which is internally lined with a thick package of heat-resistant insulation material. The remaining portions of the installation are presumed to be familiar to those skilled in the art and arc not shown for reasons of clarity. Usually, indeed preferably, a ceramic fibre material is used for the insulation layer 12, which is attached to the inner wall in the form of a fibrous, non-woven blanket or is stacked in the form of ceramic fibre slats perpendicularly to the plate wall and fastened thereto. This material has many advantages such as, for example, its excellent insulation value. its low installation weight, and its low cost price. A disadvantage can be, however, that the unsecured fibres from which the material is composed may become detached and may deposit themselves, for example, in the glazing of earthenware or china which is baked in the furnace, which will lead to unnecessary wastage.

[0026] To avoid this, the ceramic substrate material 12 is covered with a heat-resistant fabric lining 13 which is capable of stopping any fibres which detach themselves from the insulation 12. An industrial heat-resistant fabric was developed for this purpose, commercially available under the brand name of Refrex. This material comprises a woven structure of endless metal oxide fibres and can be used in a temperature range of 950-1350 °C.

[0027] This renders it eminently suitable for the application described here, where the temperatures will typically lie in that same range.

[0028] The Refrex cloth 13 is laid in strips, which overlap by approximately 50 mm, against the insulation 12 and is temporarily fixed therein with tack pins. It is also possible for smaller furnaces to manufacture complete, prefab inner linings of this material and to apply these directly against the matching insulated inner wall. The

locations of the retaining elements to be applied are marked with a felt-tip pen or some other marking means, typically in a pattern of 250 x 250 mm. In a preferred embodiment of the invention, however, a lining material is used on which these marks were previously provided, in particular in the form of a coherent printed pattern.

[0029] Retaining elements 10 of the kind described above are inserted into the insulation material 12 through the cloth 13 in the indicated locations, cf. Fig. 3. The pointed ends 6 of the retaining elements 10 easily penetrate the cloth 13 and enter the substrate 12 during this. Then a suitable injection compound 14, in this example a thermosetting paste comprising a thick suspension of aluminium oxide, is injected in excess quantity into the retaining elements 10 through the bores 3. The injected paste accordingly fills the cavities 5 and will flow out sideways through the perforations 7 in the walls of the retaining elements 10 into the substrate 12, cf. Fig. 4. A greater perforation size is used in proportion as the perforations 7 lie farther removed from the flange 2, i.e. as the distance to be covered by the injection compound for flowing out there is correspondingly greater, in order to achieve nevertheless an even outflow from the various perforations as much as possible. This increasing perforation size is clearly shown in Fig. 1, but it may indeed be omitted without departing from the scope of the invention.

[0030] The paste 14 is subsequently cured, and the anchoring of the covering cloth 13 in the substrate 10 is ready. The ceramic paste 14 and the ceramic retaining elements 10 are both highly resistant to heat and incombustible, and accordingly provide a reliable adhesion of the fabric 13 to the substrate 12 for a long period of time. The comparatively low thermal conductivity of ceramic material, but most of all the fact that the retaining elements 10 according to the invention need not penetrate right through to the furnace wall 11 and can remain inside the insulaion material implies that the retaining system according to the invention avoids the creation of heat bridges, and no perforations are made in the often gastight furnace wall.

[0031] Retaining elements of a synthetic material such as, for example, polythene may alternatively be used instead of the ceramic elements described above, which former elements can be manufactured at considerably lower cost on account of the lower material cost and the much simpler processing possibilities. Although such synthetic retaining elements will usually not be resistant to heat, they can nevertheless be used in thermal processes as described above.

[0032] The shape of a retaining element of synthetic material may be identical to that of its heat-resistant, refractory counterpart, with the proviso that preferably the flange 2 has a number of openings 4, which may or may not be elongate in shape, for example in a manner as shown in Fig. 2B.

[0033] The treatment of the cloth and the retaining elements proceeds in a manner fully analogous to that in the embodiment decribed above, with the exception that here a larger excess quantity of injection compound 14 is injected and is wiped off level so as to fill up completely also the, possibly elongate, openings 4. Then the assembly is exposed to a strongly elevated temperature, for example in that the furnace is switched on. The paste is completely cured by this, but the synthetic retaining elements will melt away, evaporate, or be burnt up until nothing remains of them any more, cf. Fig. 5. All that remains is an irregular cast 15 of the cured compound which was previously injected and which will ensure a permanent, adequate fastening of the cloth 13 to the substrate 12. The cloth is now not retained under the flange 2 of the retaining element and clamped against the substrate thereby, but instead of this under surfaces 16 of cured paste with which the, possible elongate, openings 4 were filled. The cast 15 thus formed is found to anchor itself so strongly and adhesively in the substrate 12 that it alone already forms a durable retaining element after the heating treatment. A financially highly advantageous alternative to the ceramic retaining system described above is offered thereby.

[0034] Although the invention was described in detail above with reference to only a limited number of embodiments, it will be obvious that the invention is by no means limited to the examples given. On the contrary, many more variations and modifications are possible to those skilled in the art within the scope of the invention. Thus the dimensions and measures indicated and the materials chosen are merely indicative and may be replaced by others. More in particular, the length of the retaining element will be adapted to the thickness of the insulation to be provided and the desired anchoring depth.

[0035] Neither is the retaining system according to the invention limited to the described application of covering a ceramic fibre lining with a dustproof cloth, indeed, it can be given a much wider application.

[0036] Thus it is possible by means of the same, or at least similar retaining elements, for example, to provide also a second, or even a still further insulation layer over the first one in a comparatively simple manner so as to achieve a better insulation. The system may also be used for providing prefab plates filled with ceramic insulation or heat-resistant board over existing, classical refractory coatings. Furthermore, the retaining system according to the invention may be used in module linings, stack bond linings, layered blanket linings, and ceramic fibre based board linings, as well as for refractory insulation bricks, brickwork linings, and refractory linings of compacted masses or heat-resistant concrete. In the latter cases, holes will have to be drilled into the substrate at the areas of the retaining elements to be provided, which involves an additional process step, but the system according to the invention still remains much more attractive than a conventional retaining method.

Claims

1. A retaining element for fastening a lining material (13) to a substrate (12), comprising an elongated body (1) intended to be introduced in said substrate and a fastening member (2) at a proximal end of said elongated body, extending traverse relative to said elongated body, intended to receive the lining material between said fastening member and said substrate, wherein the elongated body comprises a cavity (5) which extends axially over at least part of its length of said elongated body, and the wall of said elongated body comprises at least one channel (7) extending from said cavity to an exterior surface of said elongated body, **characterized in that** said cavity is in open fluid communication with the exterior of the elongated body at said proximal end.

2. A retaining element as claimed in Claim 1, **characterized in that** the retaining element narrows its shape towards its end situated opposite the fastening element, preferably ending in a point.

3. A retaining element as claimed in Claim 1 or 2, **characterized in that** the wall of the body comprises a number of separate perforations at the area of the cavity which are distributed over at least part of the length of the cavity.

4. A retaining element as claimed in Claim 3, **characterized in that** the perforations increase in size in a direction from the fastening member to the opposite end.

5. A retaining element as claimed in any one or several of the preceding Claims, **characterized in that** the fastening member comprises a flange which is placed substantially transversely to the body and in which a bore is locally provided so as to afford access to the cavity inside the body.

6. A retaining element as claimed in any one or several of the preceding Claims, **characterized in that** the retaining element is manufactured from a heat-resistant, for example ceramic, material.

7. A retaining element as claimed in Claim 6, **characterized in that** the retaining element comprises aluminium oxide.

8. A retaining element as claimed in Claim 5, **characterized in that** the retaining element is manufactured from a synthetic material, and **in that** slots, which may or may not be elongate in shape, are provided in the flange so as to extend through the full thickness of the flange.

9. A retaining element as claimed in Claim 4, **characterized in that** the retaining element comprises a synthetic material which can be combusted without noxious effects, such as polythene.

10. A method of protecting a substrate with a lining material, in which method the lining material is fastened by means of at least one retaining element, **characterized in that** a retaining element as claimed in any one or several of the preceding claims is used therein, **in that** the retaining element is introduced into the substrate through the lining material, **in that** a viscous compound is injected in an excess quantity into the cavity of the retaining element so as to cause this compound to flow out sideways into the substrate through the at least one perforation provided in said element, and **in that** subsequently the injected compound is cured.

11. A method as claimed in Claim 10, **characterized in that** a thermosetting paste is injected into the cavity of the body, and **in that** the entire assembly is exposed to an elevated temperature for curing said paste at least substantially completely.

12. A method as claimed in Claim 11, **characterized in that** a thermosetting paste is used which comprises a suspension of aluminium silicate fibres.

13. A method as claimed in Claim 10, 11, or 12, **characterized in that** anchoring locations are marked on the lining material beforehand.

14. A thermal installation comprising a heatable space with an inner wall which is provided with a fibrous insulation layer, **characterized in that** the insulation layer is covered with an at least substantially dustproof cloth which is fastened thereto by means of a number of retaining elements as claimed in any one or several of the Claims 1 to 6 in a manner as defined in any one or several of the Claims 10 to 13, and **in that** the retaining elements are fixed in the insulation layer by means of extrusions of a compound which have been cured to hardness and which each project laterally from the cavity of a respective retaining element through a perforation in the wall thereof into the insulation layer.

Patentansprüche

1. Halteelement zum Befestigen eines Auskleidungsmaterials (13) an einem Trägermaterial (12), mit einem länglichen Körper (1), der dazu vorgesehen ist, in das Trägermaterial eingeführt zu werden, und mit einem Befestigungsglied (2) an einem proximalen Ende des länglichen Körpers, welches sich in Bezug auf den länglichen Körper in Querrichtung erstreckt und dazu vorgesehen ist, das Auskleidungs-

material zwischen dem Befestigungsglied und dem Trägermaterial aufzunehmen, wobei der längliche Körper einen Hohlraum (5) aufweist, der sich in Axialrichtung über zumindest einen Teil der Länge des länglichen Körpers erstreckt, und wobei die Wand des länglichen Körpers zumindest einen Kanal (7) aufweist, der sich von dem Hohlraum zu einer Außenseite des länglichen Körpers erstreckt, **dadurch gekennzeichnet, dass** sich der Hohlraum an dem proximalen Ende in einer offenen Fluidverbindung mit der äußeren Umgebung des länglichen Körpers befindet.

2. Halteelement nach Anspruch 1, **dadurch gekennzeichnet, dass** das Halteelement seine Form in Richtung auf sein dem Befestigungselement gegenüberliegenden Ende verjüngt, und vorzugsweise in einem Punkt endet.

3. Halteelement nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Wand des Körpers in einem Bereich des Hohlraums eine Anzahl von getrennten Durchbrüchen aufweist, die über zumindest einen Teil der Länge des Hohlraums verteilt sind.

4. Halteelement nach Anspruch 3, **dadurch gekennzeichnet, dass** die Durchbrüche in einer Richtung von dem Befestigungsglied zu dem gegenüberliegenden Ende in ihrer Größe zunehmen.

5. Halteelement nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Befestigungsglied einen Flansch aufweist, der im Wesentlichen quer zu dem Körper angeordnet ist und in dem örtlich eine Bohrung vorgesehen ist, um einen Zugang zu dem Hohlraum innerhalb des Körpers zu ermöglichen.

6. Halteelement nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Halteelement aus einem hitzebeständigen Material, z.B. Keramik, hergestellt ist.

7. Halteelement nach Anspruch 6, **dadurch gekennzeichnet, dass** das Halteelement Aluminiumoxid aufweist.

8. Halteelement nach Anspruch 5, **dadurch gekennzeichnet, dass** das Halteelement aus einem synthetischen Material hergestellt ist, und dass in dem Flansch Schlitze vorgesehen sind, die in ihrer Form langgestreckt sein können oder nicht, und zwar so, dass sie sich durch die volle Dicke des Flansches erstrecken.

9. Halteelement nach Anspruch 4, **dadurch gekennzeichnet, dass** das Halteelement ein synthetisches Material aufweist, das ohne schädliche Auswirkungen verbrannt werden kann, wie beispielsweise Polyethylen.

10. Verfahren zum Schützen eines Trägermaterials mit einem Auskleidungsmaterial, bei dem das Auskleidungsmaterial mit Hilfe von zumindest einem Halteelement befestigt wird, **dadurch gekennzeichnet, dass** dabei ein Halteelement nach einem oder mehreren der vorhergehenden Ansprüche verwendet wird, dass das Halteelement durch das Auskleidungsmaterial in das Trägermaterial eingeführt wird, dass eine fließfähige Masse in einer überschießenden Menge in den Hohlraum des Halteelements eingespritzt wird, und zwar so, dass diese Masse durch zumindest einen in dem Element vorgesehenen Durchbruch seitwärts in das Trägermaterial hinausfließt, und dass die eingespritzte Masse anschließend ausgehärtet wird.

11. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** eine bei Hitze härtende Paste in den Hohlraum des Körpers eingespritzt wird, und dass die gesamte Anordnung zum Aushärten der Paste zumindest weitgehend vollständig einer erhöhten Temperatur ausgesetzt wird.

12. Verfahren nach Anspruch 11, **dadurch gekennzeichnet, dass** eine bei Hitze härtende Paste verwendet wird, die eine Suspension von Aluminium-Silikat-Fasern aufweist.

13. Verfahren nach Anspruch 10, 11 oder 12, **dadurch gekennzeichnet, dass** auf dem Auskleidungsmaterial vorher Verankerungspositionen markiert werden.

14. Thermische Anlage mit einem heizbaren Raum mit einer Innenwand, die mit einer faserigen Isolationsschicht versehen ist, **dadurch gekennzeichnet, dass** die Isolationsschicht mit einem zumindest weitgehend staubdichten Gewebe bedeckt ist, welches daran mit Hilfe einer Anzahl von Halteelementen nach einem oder mehreren der Ansprüche 1 bis 6 auf eine in einem oder mehreren der Ansprüche 10 bis 13 beschriebene Weise befestigt ist, und dass die Halteelemente in der Isolationsschicht mit Hilfe von Austreibungen einer Masse fixiert sind, die fest ausgehärtet sind und die aus dem Hohlraum eines jeden Halteelements durch einen Durchbruch in dessen Wand seitlich in die Isolationsschicht hineinragen.

Revendications

1. Elément de retenue destiné à la fixation d'un matériau de revêtement (13) sur un substrat (12), com-

prenant un corps allongé (1) destiné à être introduit dans le substrat et un organe de fixation (2) à une extrémité interne du corps allongé, s'étendant transversalement au corps allongé et destiné à loger le matériau de revêtement entre l'organe de fixation et le substrat, dans lequel le corps allongé comporte une cavité (5) qui s'étend axialement sur une partie au moins de la longueur du corps allongé, et la paroi du corps allongé comporte au moins un canal (7) qui s'étend de la cavité vers une surface extérieure du corps allongé, **caractérisé en ce que** la cavité communique librement pour la circulation du fluide avec l'extérieur du corps allongé à l'extrémité interne.

2. Elément de retenue selon la revendication 1, **caractérisé en ce que** l'élément de retenue a une forme qui se rétrécit vers son extrémité opposée à l'élément de fixation, de préférence en se terminant par une pointe.

3. Elément de retenue selon la revendication 1 ou 2, **caractérisé en ce que** la paroi du corps comprend un certain nombre de perforations séparées dans la région de la cavité, qui sont réparties sur une partie au moins de la longueur de la cavité.

4. Elément de retenue selon la revendication 3, **caractérisé en ce que** les perforations ont une dimension qui augmente de l'organe de fixation vers l'extrémité opposée.

5. Elément de retenue selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** l'organe de fixation comporte un flasque pratiquement transversal au corps, et dans lequel un trou est disposé localement afin qu'il donne accès à la cavité placée dans le corps.

6. Elément de retenue selon une ou plusieurs des revendications précédentes, **caractérisé en ce que** l'élément de retenue est fabriqué en un matériau réfractaire, par exemple céramique.

7. Elément de retenue selon la revendication 6, **caractérisé en ce que** l'élément de retenue est formé d'oxyde d'aluminium.

8. Elément de retenue selon la revendication 5, **caractérisé en ce que** l'élément de retenue est fabriqué en un matériau de synthèse, et **en ce que** des fentes, qui peuvent avoir une forme allongée ou non, sont disposées dans le flasque afin qu'elles s'étendent sur toute l'épaisseur du flasque.

9. Elément de retenue selon la revendication 4, **caractérisé en ce que** l'élément de retenue est formé d'un matériau de synthèse qui peut brûler sans effet toxique, par exemple de polyéthylène.

10. Procédé de protection d'un substrat par un matériau de revêtement, dans lequel le matériau de revêtement est fixé par au moins un élément de retenue, **caractérisé en ce qu'**un élément de retenue selon une ou plusieurs des revendications précédentes est utilisé, **en ce que** l'élément de retenue est introduit dans le substrat à travers le matériau de revêtement, **en ce qu'**un composé visqueux est injecté en quantité excessive dans la cavité de l'élément de retenue pour qu'il provoque l'écoulement du composé latéralement vers l'extérieur dans le substrat par au moins une perforation formée dans l'élément, et **en ce que** le composé injecté est ensuite durci.

11. Procédé selon la revendication 10, **caractérisé en ce qu'**une pâte thermodurcissable est injectée dans la cavité du corps, et **en ce que** la totalité de l'ensemble est exposée à une température élevée pour le durcissement de la pâte de manière pratiquement complète au moins.

12. Procédé selon la revendication 11, **caractérisé en ce qu'**une pâte thermodurcissable est utilisée et comprend une suspension de fibres de silicate d'aluminium.

13. Procédé selon la revendication 10, 11 ou 12, **caractérisé en ce que** des emplacements d'ancrage sont marqués au préalable sur le matériau de revêtement.

14. Installation thermique comprenant un espace qui peut être chauffé, ayant une paroi interne qui est munie d'une couche fibreuse d'isolation, **caractérisée en ce que** la couche d'isolation est recouverte d'au moins une étoffe pratiquement imperméable à la poussière, qui lui est fixée par un certain nombre d'éléments de retenue selon une ou plusieurs des revendications 1 à 6 de la manière définie dans une ou plusieurs des revendications 10 à 13, et **en ce que** les éléments de retenue sont fixés dans la couche d'isolation par des extrusions d'un composé qui a été durci à l'état dur et qui dépassent chacune latéralement de la cavité d'un élément respectif de retenue par une perforation de sa paroi dans la couche d'isolation.

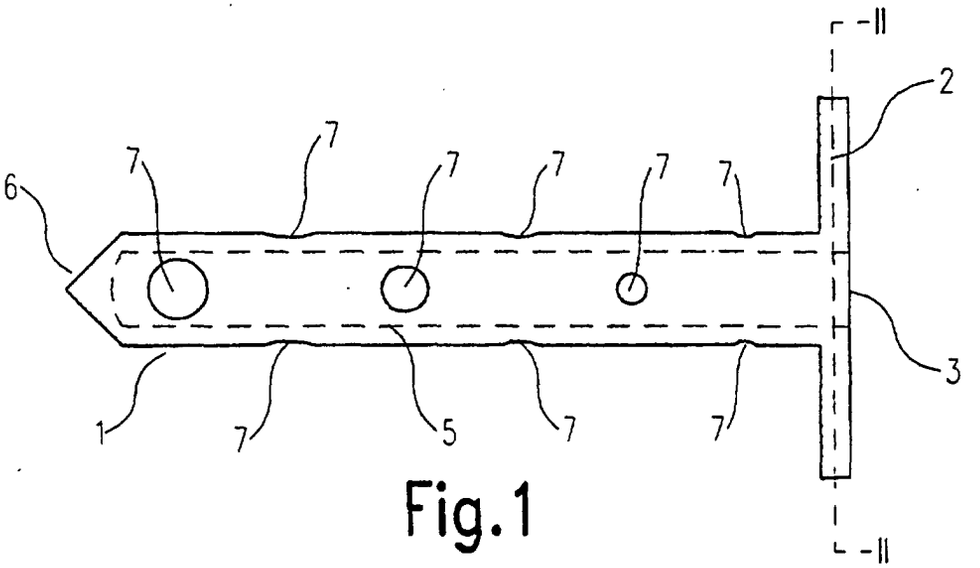

Fig.1

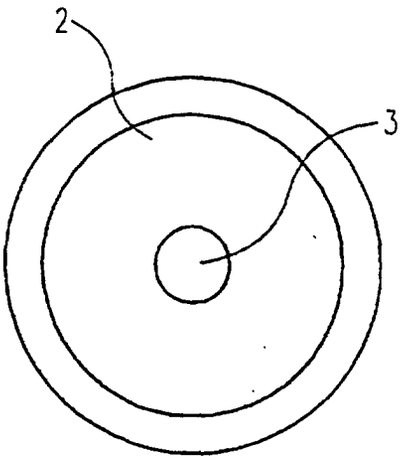

Fig.2A

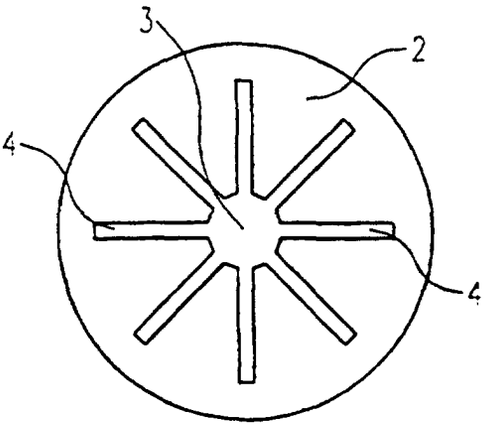

Fig.2B

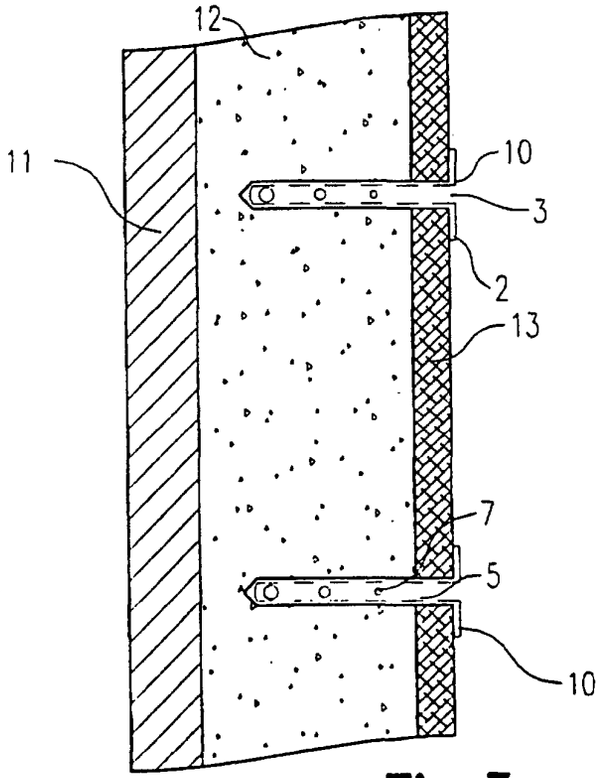

Fig.3

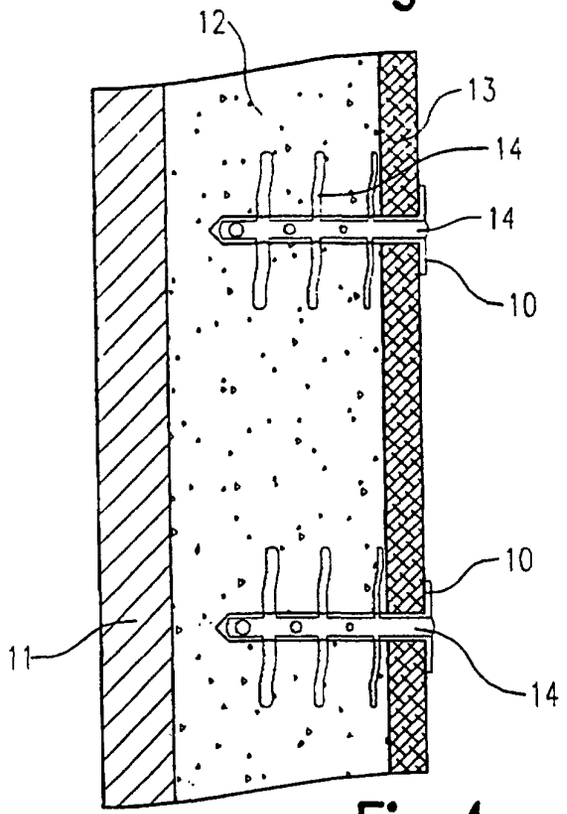

Fig.4

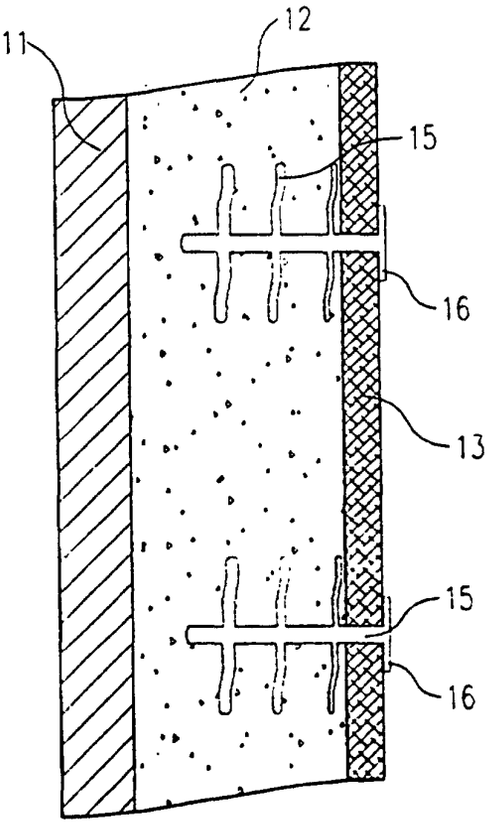

Fig.5