is therefore the risk of heat conduction losses occurring via the transitions and of weakened mechanical stability, which is fundamentally undesirable. To prevent such heat conduction losses and maintain mechanical stability, additional elements made of graphite, carbon-fibre-based composite materials or metal can be provided at the joining surfaces. However, this leads to material build-up and/or to an accumulation of different materials, which is associated with high complexity and accordingly with higher production and storage costs. Moreover, owing to the structural separation of mechanical stability and thermal resistance, the material properties of the component parts are not locally exploited in an optimum manner.

It is therefore an object of the invention to provide a thermal insulation body which can be produced simply and cost-effectively from a plurality of component parts and which also has a reliable insulating effect and sufficiently high mechanical stability in the transition regions between the various component parts.

Summary

In a first aspect, the present invention refers to thermal insulation body (11, 11') made of a material comprising carbonised fibres and/or graphitised fibres, in particular for lining a high-temperature furnace, wherein the thermal insulation body (11, 11') is assembled from at least two component parts (13, 13'), wherein at least two assembled component parts (13, 13') each have at least one connection element (17, 17') and the connection elements (17, 17') of the at least two assembled component parts (13, 13') engage in a form-fitting manner to form an undercut (19) and in force-locking manner to form a press fit.

In a further aspect, the present invention refers to method for producing a thermal insulation body (11, 11'), in particular a thermal insulation body ~~according to at least one of the preceding claims~~as disclosed herein, comprising the following steps providing at least two component parts (13, 13') made of a material comprising carbonised fibres and/or graphitised fibres, wherein at least one connection element (17, 17') for form-fitting engagement to form an undercut (19) is provided on at least two assembled component parts (13, 13'); and assembling the component parts (13, 13') to form a thermal insulation body (11, 11') by coupling the connection elements (17, 17').

Detailed description

The object of the present invention is achieved by a thermal insulation body having the features of claim 1 and in particular by a thermal insulation body made of a material comprising carbonised fibres and/or graphitised fibres, in particular for lining a high-temperature furnace, wherein the thermal insulation body is assembled from at least two component parts, wherein at least two assembled component parts each have at least one connection element and the connection elements of the at least two assembled component parts engage in an at least form-fitting manner, or even engage in a form-fitting and force-locking manner, to form an undercut.

According to the invention, at least one connection element is provided in each case on at least two assembled component parts; that is to say, connection elements are provided on at least individual portions of the joining surfaces at which the component parts are assembled and these connection elements engage in an at least form-fitting manner to form an undercut. Owing to the undercut, the component parts are securely held together at the contacting joining surfaces – preferably in five of the six mutually orthogonal spatial directions – and can no longer be separated even under the operating conditions in a high-temperature furnace. This eliminates the need for complex adhesion of the component parts. Movement in the sixth spatial direction is preferably restricted by means of a force-locking connection. This also means that additional reinforcing elements, such as steel bands, can be dispensed with, thereby significantly cutting production and storage costs. A further particular

Claims

1. Thermal insulation body ~~(11, 11')~~ made of a material comprising carbonised fibres and/or graphitised fibres, in particular for lining a high-temperature furnace, wherein the thermal insulation body ~~(11, 11')~~ is assembled from at least two component parts ~~(13, 13')~~, wherein at least two assembled component parts ~~(13, 13')~~ each have at least one connection element ~~(17, 17')~~ and the connection elements ~~(17, 17')~~ of the at least two assembled component parts ~~(13, 13')~~ engage in a form-fitting manner to form an undercut ~~(19)~~and in force-locking manner to form a press fit.

~~2. Thermal insulation body according to claim 1, characterised in that the connection elements (17, 17') of the at least two assembled component parts (13, 13') additionally engage in a force-locking manner to form a press fit.~~

~~3~~2. Thermal insulation body according to either claim 1 ~~or claim 2~~, characterised in that the connection elements ~~(17, 17')~~ of the at least two assembled component parts ~~(13, 13')~~ are formed directly onto the component parts ~~(13, 13')~~ of the thermal insulation body ~~(11, 11')~~.

~~4~~3. Thermal insulation body according to at least one of the preceding claims, characterised in that at least one of the component parts ~~(13, 13')~~ and preferably all component parts ~~(13, 13')~~, including the connection elements ~~(17, 17')~~, is/are produced from a homogenous felt composed of carbonised fibres and/or graphitised fibres.

~~5~~4. Thermal insulation body according to claim ~~4~~3, characterised in that at least one of the component parts ~~(13, 13')~~ and preferably all component parts ~~(13, 13')~~, including the connection elements ~~(17, 17')~~, is/are produced from the same material, which is preferably a soft felt, particularly an impregnated one, composed of carbonised fibres and/or graphitised fibres, or a hard felt composed of carbonised fibres and/or graphitised fibres.

~~6~~5. Thermal insulation body according to at least one of the preceding claims, characterised in that the thermal insulation body ~~(11)~~ is formed as a hollow profile and preferably as a hollow cylinder.

~~7~~6. Thermal insulation body according to claim ~~6~~5, characterised in that the component parts ~~(13, 13')~~ are planar and form a wall of the hollow profile, each undercut ~~(19)~~ being effective transversely to a surface normal of the wall.

~~8~~7. Thermal insulation body according to at least one of the preceding claims, characterised in that at least two of the component parts ~~(13, 13')~~ and preferably all component parts ~~(13, 13')~~ are assembled by means of dovetail connections.

~~9~~8. Thermal insulation body according to at least one of the preceding claims, characterised in that the connection elements are designed as oblong grooves ~~(30)~~ and tongues ~~(31)~~ which fit therein, which grooves and tongues each have flanks ~~(21)~~ that are inclined relative to one another to form the undercut ~~(19)~~.

~~10~~9. Thermal insulation body according to claim ~~9~~8, characterised in that, viewed in the longitudinal direction, some portions of the grooves ~~(30)~~ and of the tongues ~~(31)~~ do not form an undercut and preferably do not form a press fit either.

~~11~~10. Thermal insulation body according to at least one of the preceding claims, characterised in that the component parts ~~(13, 13')~~ are formed as plates, the connection elements ~~(17, 17')~~ being provided on at least two opposing narrow sides ~~(14)~~ and preferably on all four narrow sides of each plate.

~~12~~11. Thermal insulation body according to at least one of the preceding claims, characterised in that the joining surfaces ~~(15, 15')~~ of the planar component parts ~~(13, 13')~~ form at least one step ~~(27)~~ viewed in the direction of the surface normal.

~~13~~12. Method for producing a thermal insulation body ~~(11, 11')~~, in particular a thermal insulation body according to at least one of the preceding claims, comprising the following steps:

- providing at least two component parts ~~(13, 13')~~ made of a material comprising carbonised fibres and/or graphitised fibres, wherein at least one connection element ~~(17, 17')~~ for form-fitting engagement to form an undercut ~~(19)~~ is provided on at least two assembled component parts ~~(13, 13')~~; and
- assembling the component parts ~~(13, 13')~~ to form a thermal insulation body ~~(11, 11')~~ by coupling the connection elements ~~(17, 17')~~.

~~14~~13. Method according to claim ~~13~~12, characterised in that the connection elements ~~(17, 17')~~ are produced by machining the surface of component part blanks of a homogenous felt material, preferably of a soft felt, in particular an impregnated one, or of a hard felt.

~~15~~14. Method according to either claim ~~13~~ 12 or claim ~~14~~13, characterised in that, when providing the component parts ~~(13, 13')~~, an allowance for a press fit is provided on the connection elements ~~(17, 17')~~, which allowance is preferably at most 0.5 mm, more preferably at most 0.25 mm and most preferably between 0.01 mm and 0.2 mm.