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(54) **GAS TURBINE COMBUSTOR WITH TILE HAVING ACCESS HOLE FOR SPARK PLUG**

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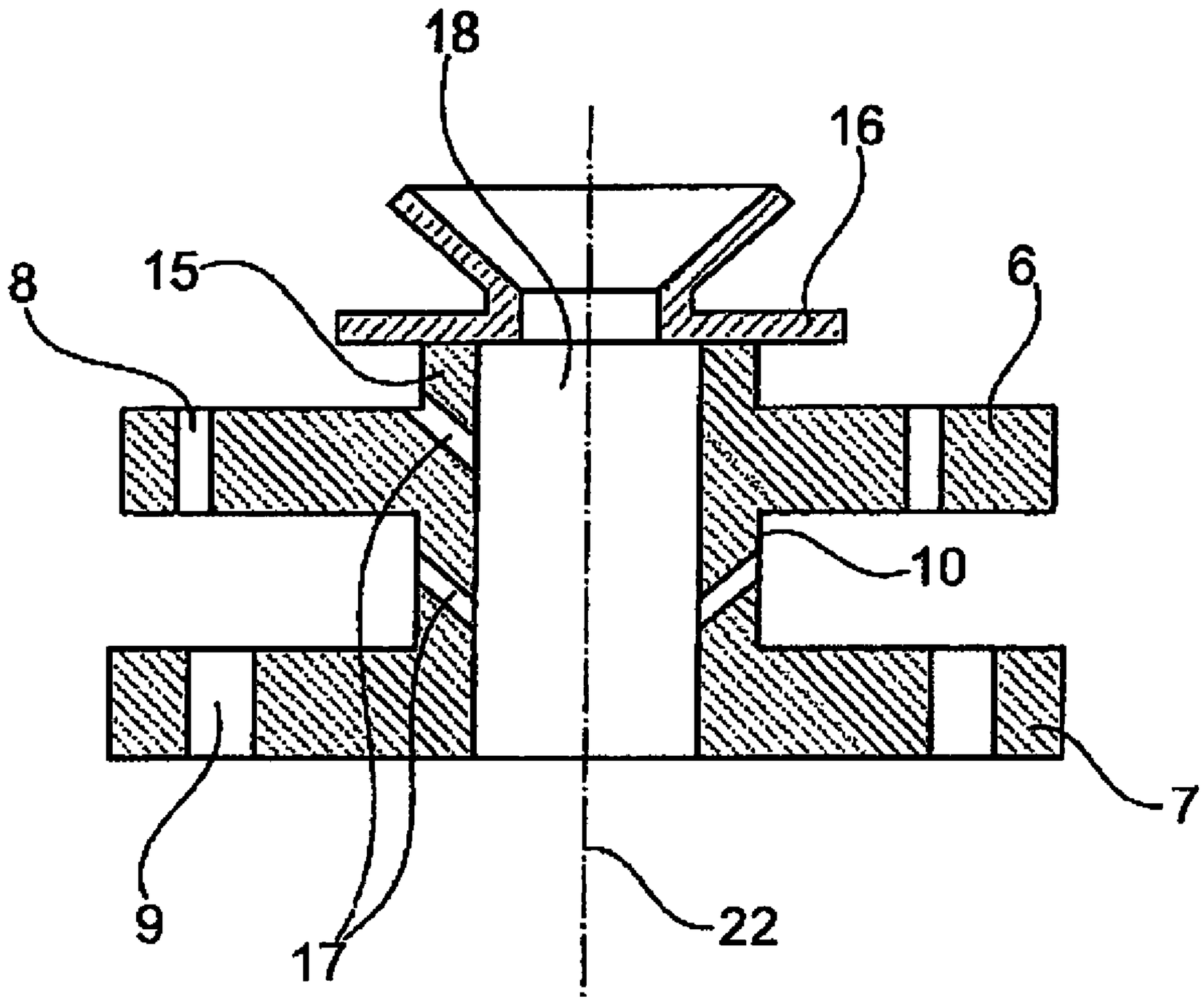
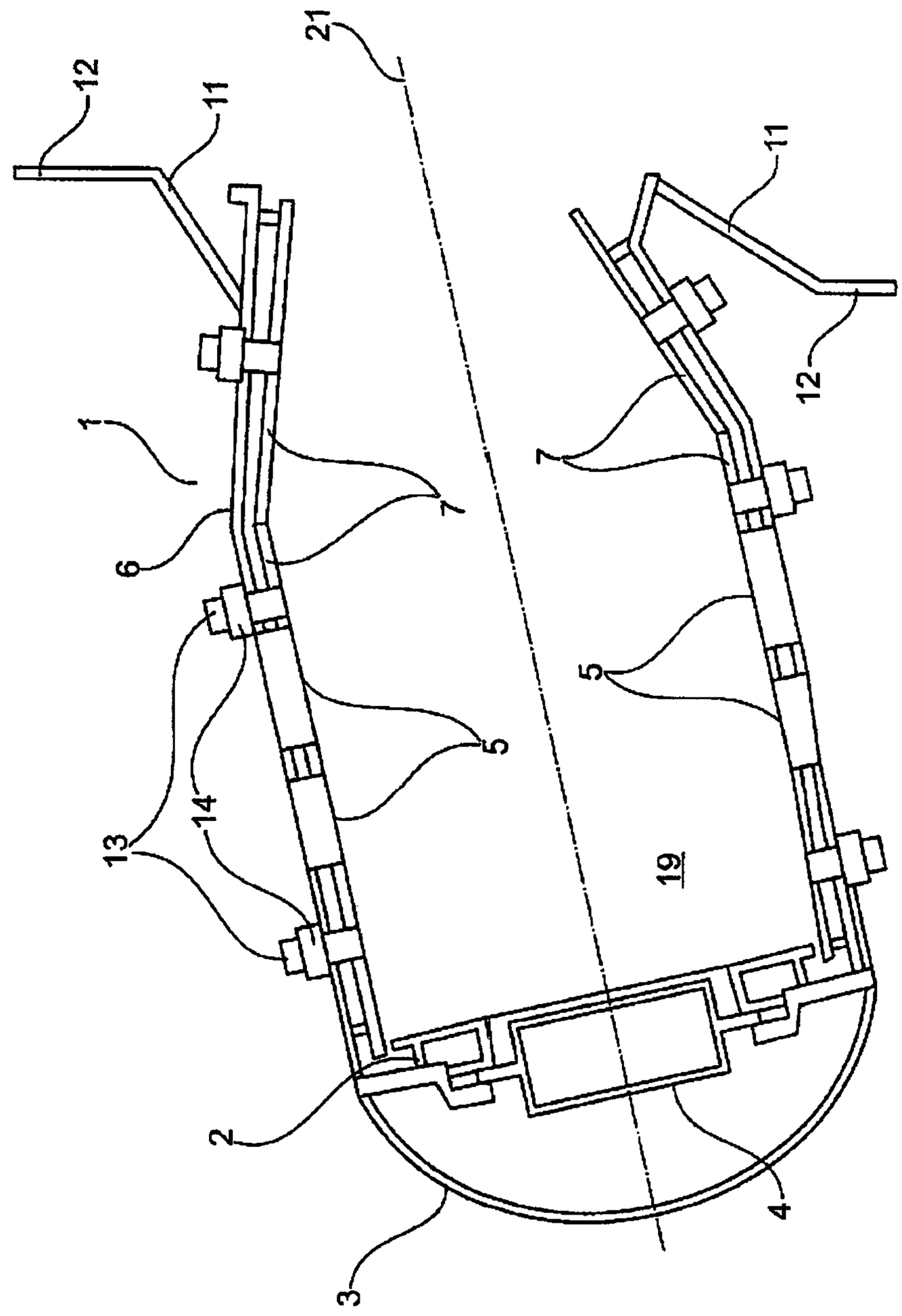
(57) **ABSTRACT**

The present invention relates to a gas-turbine combustion chamber with a combustion chamber wall, on which tiles are arranged, and with a recess for passing through an igniter plug, said recess extending through the combustion chamber wall and a tile, with the tile being provided with a tubular projection surrounding the recess and extending from that side of the tile facing away from a combustion chamber interior.





State of the art

Fig. 1

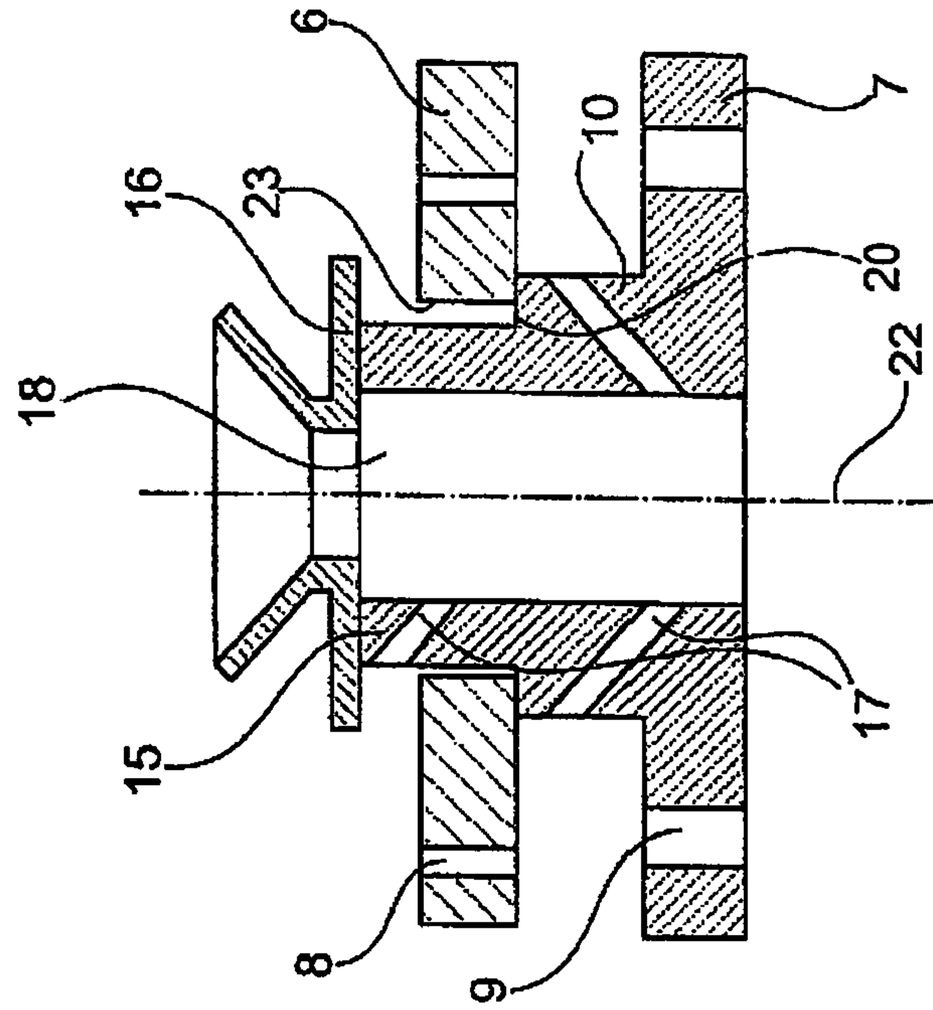


Fig. 2

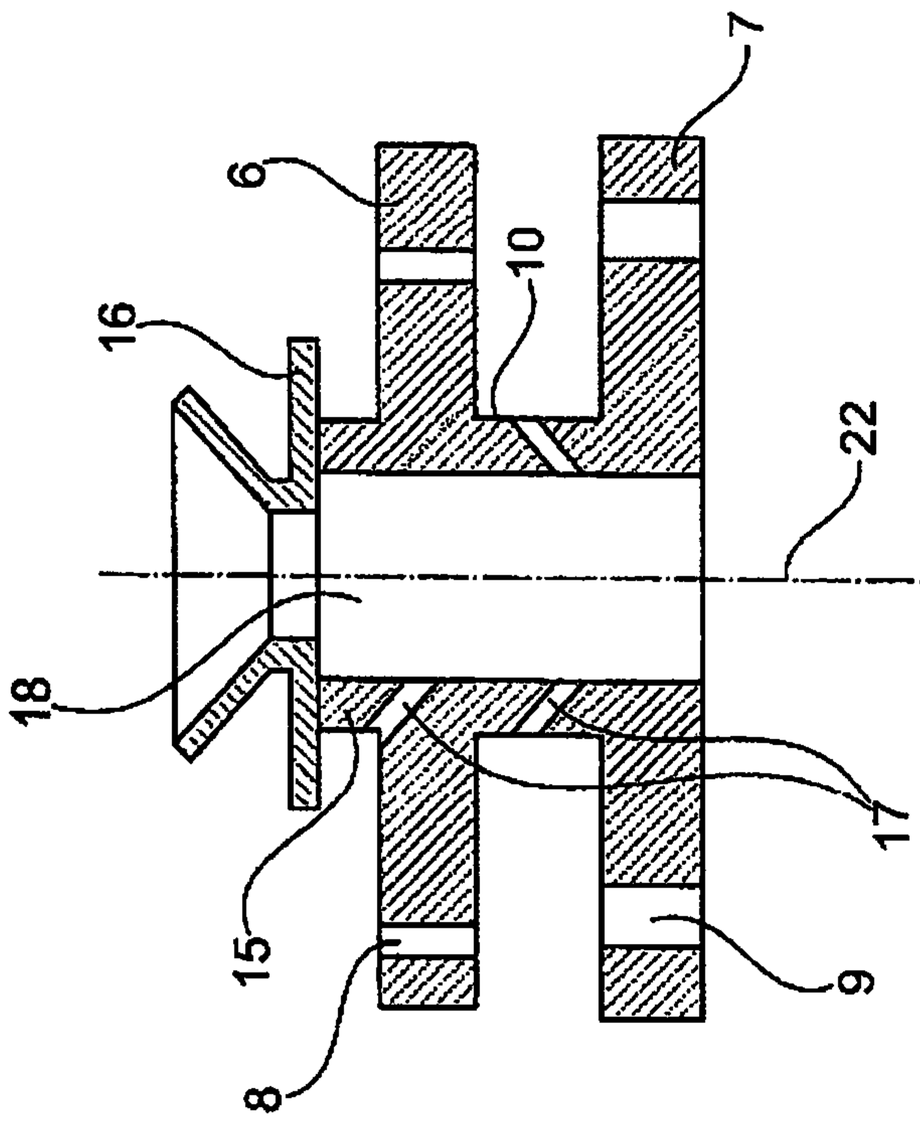


Fig. 3

GAS TURBINE COMBUSTOR WITH TILE HAVING ACCESS HOLE FOR SPARK PLUG

[0001] This invention relates to a gas-turbine combustion chamber and, in particular, to a gas-turbine combustion chamber tile designed for passing through an igniter plug. The combustion chambers of gas turbines, in particular of aircraft gas turbines, usually have a combustion chamber wall forming a supporting structure for tiles. The tiles are arranged on the inside of the combustion chamber wall in order to shield the latter from the hot gas and to thermally insulate the supporting structure. A space, through which cooling air is passed, is usually provided between the tiles and the supporting structure.

[0002] Tiled combustion chambers of this type are known for example from EP 0 576 435 A1, EP 0 741 268 A1 or EP 1 710 501 A2. Using the described tiles, which are cooled by means of impingement cooling and provided with effusion cooling holes, protects the supporting and sealing structure of the combustion chamber wall from the intensive heat radiation of the flame. The supporting and sealing structure thus remains at a lower temperature and retains its mechanical strength.

[0003] For ignition of combustion chambers, it is necessary to pass at least one igniter plug through the combustion chamber wall or supporting structure and through the tile in order to reach the combustion space of the combustion chamber. Since the igniter plug is fastened at one place in the casing of the gas turbine while the combustion chamber is mounted at another place of the casing, relative movements ensue. Furthermore, it is necessary to compensate for component tolerances by the movability of the igniter plug inside the combustion chamber, without any load being transferred to the igniter plug. Additionally, the combustion chamber heats up more quickly and to higher temperatures during operation, so that differing thermal expansions have to be compensated for. In the area of the igniter plug hole, component tolerances and thermal expansions are compensated for by enlarging the igniter plug hole in the combustion chamber, so that the igniter plug hole has a greater diameter than the igniter plug. This results in a gap which must be closed by a seal.

[0004] A tiled combustion chamber is already known from U.S. Pat. No. 7,093,441 B2 which has a so-called igniter plug tower, through which the igniter plug can be passed in a sealed manner. An additional igniter plug tower of this type results in additional weight. Furthermore, additional costs for its manufacture must be calculated. Moreover, the igniter plug tower imposes a minimum distance between the combustion chamber wall and the casing of the gas turbine. This results, in particular in the case of smaller engines, in a larger diameter of the pressure casing being needed, so that the costs and the weight increase considerably.

[0005] The object underlying the present invention is to provide a gas-turbine combustion chamber with a tile for passing through an igniter plug as well as a gas-turbine combustion chamber tile, which, while being simply designed and easily and cost effectively producible, avoid the disadvantages of the state of the art and enable a dependable and simple arrangement of an igniter plug.

[0006] It is a particular object of the present invention to provide solution to the above problematics by the combination of the features of the independent Claims. Further advantageous embodiments of the present invention become apparent from the sub-claims.

[0007] The invention thus provides for the tile to be designed with a recess for passing through an igniter plug, with a tubular and collar-like projection being provided at the tile, enclosing the recess for passing through the igniter plug and extending from that side of the tile facing away from the combustion chamber interior. The tubular projection is thus dimensioned in accordance with the invention such that it extends from the tile through the combustion chamber wall (supporting structure) to the cold side of the combustion chamber wall. The tubular projection is in particular designed and dimensioned here such that it is passed with a tight fit through the recess provided in the combustion chamber wall or supporting structure.

[0008] In accordance with the invention, therefore, no separate component is required, and instead the tile itself is designed in a suitable way in order to provide the recess for passing through the igniter plug in such a way that the igniter plug can be passed through and held in a simple and operationally safe manner.

[0009] The tile provided in accordance with the invention is, as mentioned, designed in one piece with the tubular projection. The tile can here be produced as a casting or manufactured by means of a laser deposition welding method (DLD).

[0010] In a particularly favourable development of the invention, it is provided that the tubular projection has an igniter plug seal at its free end area, which projects through the combustion chamber wall beyond the cold side of the combustion chamber wall. The seal can in particular be designed here such that it does not contact the combustion chamber wall (supporting structure), in order not to create any heat transfer in this area.

[0011] In a further advantageous embodiment of the invention, it is provided that the tubular projection or collar has an annular contact surface or a stage for positioning the annular projection against the hot side of the combustion chamber wall (supporting structure). On the one hand, this results in sealing of the cooling air space between the combustion chamber wall and the tile, and on the other hand provides additional support and mounting of the tile.

[0012] In a particularly advantageous development of the invention it is provided that the tubular projection has at least one cooling air recess through which cooling air can be supplied to the inner wall of the tubular projection and hence to the igniter plug in order to cool the latter.

[0013] The solution in accordance with the invention thus has the advantage that secure mounting and arrangement of the igniter plug is possible without an igniter plug tower. Since the tile is made of a more wear-resistant material than the combustion chamber wall, an operationally safe mounting and positioning of the igniter plug is assured. Furthermore, the igniter plug hole (recess of the tubular projection) can, in accordance with the invention, be provided particularly precisely in a later production step in order to further reduce component tolerances by positioning it relative to the mounting of the combustion chamber. To facilitate assembly, the above mentioned igniter plug seal can be additionally fastened to the holder of the igniter plug.

[0014] The present invention is described in the following in light of the accompanying drawing, showing exemplary embodiments. In the drawing,

[0015] FIG. **1** shows a simplified sectional view of a combustion chamber in accordance with the state of the art,

[0016] FIG. **2** shows a detail sectional view of a combustion chamber tile with tubular projection in accordance with the present invention, and

[0017] FIG. **3** shows a further exemplary embodiment in analogous representation of FIG. **2**.

[0018] FIG. **1** shows in a schematic sectional view a gas-turbine combustion chamber **1** as known from the state of the art. The combustion chamber **1** has a heat shield **2**, a combustion chamber head **3** and a burner seal **4**. Several tiles **7** are fastened to a cooling-air side combustion chamber wall **6** at a distance from said combustion chamber wall **6**.

[0019] Furthermore, the combustion chamber wall **6** and the tiles **7** have admixing holes **5** for supplying air. The tiles **7** are fastened using bolts **13** and nuts **14**, while the combustion chamber wall **6** is mounted by means of a combustion chamber suspension **11** and a combustion chamber flange **12**.

[0020] Illustration of an igniter plug was dispensed with in FIG. **1** for the sake of clarity. In this respect reference is made to U.S. Pat. No. 7,093,441 B2.

[0021] FIG. **2** shows a first exemplary embodiment of an inventive design of a combustion chamber tile **7**. As known from the state of the art, this tile is provided with effusion cooling holes **9** and is cooled by, means of cooling air supplied via impingement cooling holes **8** of the combustion chamber wall **6**.

[0022] In accordance with the invention, the tile **7** is provided with a tubular projection **15** extending in the direction of the combustion chamber wall **6** and passed through a recess **23** of the combustion chamber wall **6**. The tubular projection **15** is designed in one piece with the tile **7**, for example by means of a casting process.

[0023] To ensure a defined distance of the tile **7** from the combustion chamber wall **6** and to position the tile **7** on the combustion chamber wall **6**, the tubular projection **15** has a connecting web **10** forming an annular contact surface **20**, against which rests the combustion chamber wall **6**. The annular projection **15** is provided with a centric recess **18** forming a through-hole for an igniter plug.

[0024] FIG. **2** furthermore shows an igniter plug seal **16**, which is arranged at a distance from the combustion chamber wall **6**, since the tubular projection **15** extends through the combustion chamber wall **6**.

[0025] The tubular projection **15** is furthermore provided with several cooling air recesses **17** through which cooling air can be introduced into the recess **18** in order to cool the igniter plug.

[0026] FIG. **3** shows a further exemplary embodiment in an analogous representation, with identical parts being provided with the same reference numerals. Repetition of the description can therefore be dispensed with. In the exemplary embodiment of FIG. **3**, the tile **7** is designed in one piece with an area of the combustion chamber wall **6** and manufactured by means of a DLD method. The area of the combustion chamber wall **6** provided at the tile **7** is connected by suitable means to the remaining combustion chamber wall.

LIST OF REFERENCE NUMERALS

[0027] **1** Combustion chamber
[0028] **2** Heat shield
[0029] **3** Combustion chamber head
[0030] **4** Burner seal
[0031] **5** Admixing hole
[0032] **6** Cooling-air side combustion chamber wall
[0033] **7** Tile
[0034] **8** Impingement cooling hole
[0035] **9** Effusion cooling hole
[0036] **10** Connecting web
[0037] **11** Combustion chamber suspension
[0038] **12** Combustion chamber flange
[0039] **13** Bolt
[0040] **14** Nut
[0041] **15** Tubular projection
[0042] **16** Igniter plug seal
[0043] **17** Cooling air recess
[0044] **18** Recess
[0045] **19** Combustion chamber interior
[0046] **20** Annular contact surface
[0047] **21** Combustion chamber center axis
[0048] **22** Center axis
[0049] **23** Recess

1. Gas-turbine combustion chamber tile with a recess for passing through an igniter plug, wherein the tile is provided with a tubular projection surrounding the recess and extending from that side of the tile facing away from a combustion chamber interior.

2. Tile in accordance with claim **1**, wherein the projection is designed in one piece with the tile.

3. Tile in accordance with claim **1**, wherein the projection is provided at its free end area with an igniter plug seal.

4. Tile in accordance with one of the claims **1**, wherein the projection is provided with an annular contact surface on its outer circumference.

5. Tile in accordance with claim **1**, wherein the projection is provided with at least one cooling air recess extending through the wall of the projection.

6. Tile in accordance with claim **1**, wherein the tile with the projection is provided as a casting.

7. Tile in accordance with claim **1**, wherein the tile with the projection is manufactured by means of a laser deposition welding method.

8. Gas-turbine combustion chamber with a combustion chamber wall, on which tiles are arranged, and with a recess for passing through an igniter plug, said recess extending through the combustion chamber wall and a tile, wherein the tile is designed in accordance with claim **1**.

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