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### (54) BURNER ARRANGEMENT

(57) It is disclosed a fuel insert (1), suitable for liquid fuel fireplaces, comprising a fuel supply part (2) comprising at least one fuel supply channel (5), wherein the fuel supply part (2) comprises an upper plane surface (9) comprising at least one fuel spreading slit (4) connected

to the fuel supply channel (5), the fuel spreading slit (4) being cut into a substantial part of the fuel supply part (2), thereby forming a long and narrow opening in the upper surface (9), and that it comprises a temperature regulating means (3).

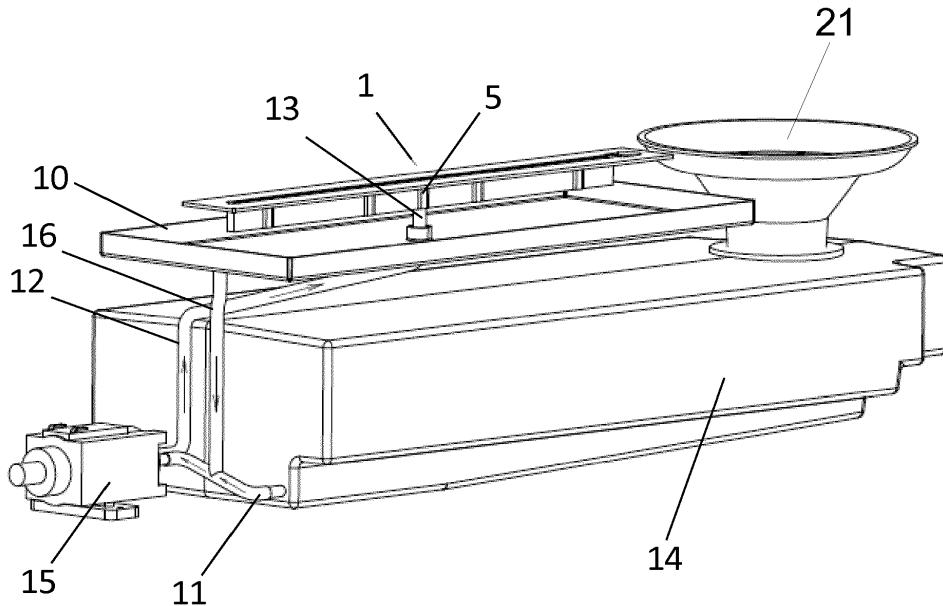


Fig. 4

## Description

**[0001]** The present invention relates to a burner insert for a liquid fuel fireplace, more specifically to fireplaces using volatile fuels. The invention also relates to a fireplace comprising such burner insert.

**[0002]** To allow households without access to a chimney to furnish the apartment or house with a fireplace, it has been developed fireplaces using fuel resources other than wood or charcoal that do not require an escape for the fumes from combustion. One of the fuels used in this type of fireplace is ethanol. Ethanol is a suitable fuel source due to its many good qualities. Ethanol is easy to light up, has a decorative flame, produces a controllable amount of heat and produces mainly water and hydrogen as combustion products.

**[0003]** However, there are also some disadvantages with ethanol. It evaporates easily in the concentrations used in liquid fuel fireplaces, and therefore can leave ignitable gases in the vicinity of the fuel reservoir. If there is only a small amount of fuel in the combustion chamber of the fireplace, there can be an almost invisible blueish flame present above the fuel residues. If a careless person starts to refill the combustion chamber without following necessary safety procedures to ensure that no such residue flames are present, the liquid fuel or gases evaporating under the refill process can ignite and cause an explosion.

**[0004]** The applicant has presented a fireplace with an improved burner arrangement seeking to eliminate the danger of explosion during the refill process. The fireplace and burner arrangement is described in EP 2 735 792. In this publication, it is described a fireplace comprising a burner arrangement, a fuel reservoir and a fuel-providing system leading fuel from the reservoir to the burner arrangement. Only a small amount of fuel is present in the burner arrangement. When there is a need for refill of fuel, the refill process is completely separated from the fire arrangement. Furthermore, as there is only a small amount of fuel present in the burner arrangement or "flame reservoir", there is no danger of residue flames as the remaining fuel will evaporate into the surroundings without obtaining a fume concentration in the air which is sufficient for ignition. The fuel is spread in a narrow and elongated burner manifold comprising a rod in such a way that the fuel will form a wet surface on the rod and burn as it evaporates from the rod. Since the flame in addition to the heating purpose, also shall be decorative, it is important that the impression of the flames and the height of the flames are as large as possible for the given amount of fuel.

**[0005]** It is an object with the present invention to provide an improved burner arrangement with a burner insert that provides an even combustion of fuel with a high flame, and with an improved safety compared with prior art solutions. It is therefore presented a burner insert according to claim 1.

**[0006]** Also described is a burner arrangement accord-

ing to claim 8 and a fireplace comprising such burner arrangement according to claim 11.

**[0007]** The above and other objects or advantages of the present invention will become apparent from the following description of a non-limiting exemplary embodiment in the attached drawings where:

Fig. 1 shows a perspective view of an exemplary embodiment of a burner insert according to the present invention.

Fig. 2 shows a side view with a partial cross section of the burner insert of fig. 1.

Fig. 3 shows a cross sectional side view of the burner insert taken along the line A-A in fig. 2.

Fig. 4 shows a perspective view of a burner arrangement comprising the burner insert of fig. 1.

Fig. 5 is a schematic diagram of the control device controlling the operation of the burner.

**[0008]** Fig. 1 shows the burner insert 1 according to the present invention. The burner insert 1 comprises a standing fuel supply part 2 and a temperature control means 3. The fuel supply part 2 comprises at least one fuel spreading slit 4 and one or more fuel supply channels 5. When the burner insert 1 is mounted in a fireplace, the fuel supply channels are connected to a fuel feeding system in the fireplace.

**[0009]** The temperature control means 3 are formed as one or more projections extending outwardly from the surface of the burner insert 1. The temperature control means 3 are formed in such a way that it can collect heat from the flame and distribute the heat over the control means 3. In this way, the temperature in the vicinity of the flame or flames is lowered. At the same time, the heat maintained in the control means 3 will help keep a more constant overall temperature in the burner insert as the heat is evened out over the length of the burner insert. The heat distributed over the control means will then be reintroduced in the fuel being inserted, raising the temperature in the fuel before it evaporates, which again can help obtaining an even flame formation.

**[0010]** However, it is essential to obtain a good ratio between the width of the temperature control means 3 and the size of the burner insert. Too narrow control means 3 will not absorb enough heat from the flames to heat up the new cold fuel from the inlet. This will result in less evaporation and less flames. Too wide control means 3 may cause a too much heat absorption and lead to boiling, of the which again gives unwanted noise and risk for flying burning drops being emitted to the surroundings.

**[0011]** The burner insert 1 according to the present embodiment is also provided with anchoring means 6 suitable for fixing the burner insert to a burner arrangement to be placed in the fireplace. The anchoring means 6 can for example be holes into which bolts, nails or the like can be fixed. However, it is also envisageable to fix or anchor the burner insert to the burner arrangement by

other permanent or releasable anchoring means.

[0012] The burner insert 1 is also provided with an ignitor accommodation 7 suitable for accommodating an ignitor. The ignitor accommodation 7 can be a cavity or groove suitable for arranging the ignitor, an attachment means suitable for attaching the ignitor, a clamping means for clamping the ignitor to the burner insert etc. The ignitor should be arranged close to the fuel spreading slit 4 so that it can light the fuel being provided in the fuel spreading slit 4.

[0013] Fig. 2 shows a side view with a partial cross section of the burner insert 1 showing the fuel spreading slit 4 and one fuel supply channel 5. The fuel supply channel 5 leads fuel from a fuel reservoir and a fuel feeding arrangement in the fireplace (not shown) to the fuel spreading slit 4. The channel or channels 5 is/are arranged in such a way that the fuel is evenly distributed along the length of the fuel insert 1 when in use.

[0014] The fuel feeding arrangement comprises a pumping means for pumping fuel from the reservoir towards the burner insert. The fuel feeding arrangement is provided with control means controlling the flow rate of the fuel in the fuel feeding arrangement. This way, it is possible to regulate the output of flames in the fireplace, i.e. the amount of heat generated or the height or amount of flames present should advantageously be adjustable.

[0015] Fig. 3 shows a cross sectional side view of the burner insert 1 taken along the line A-A in fig. 2. The fuel spreading slit 4 has a width that is narrow enough to ensure that only a very small amount of fuel can be present in the slit 4 at any time. The amount of fuel should be so limited that, if there is no flame on the burner insert 1, the fuel in the slit 4 will evaporate within short time, such as for example within a minute or even half a minute or even within seconds. The burner insert 1 has an upper surface 9.

[0016] The burner insert 1 is provided with temperature control means 3 in the form of elongated projections projecting out from the fuel supply part 2. The burner insert 1 is made in a heat-conducting material, such as metal, heat-conducting polymer or ceramic material. The temperature control means 3 will lead heat away from the surface of the fuel supply part where the fuel in the slit 4 is burning, when the insert is mounted in a fireplace. The temperature control means 3 helps to keep a low temperature on and in the burner insert during use. This is beneficial with regard to safety of the fireplace, as a low temperature functional temperature in a fireplace prevents fire accidents. Simultaneously the temperature control means 3 will function as a heat storing element, to ensure that the temperature in the burner insert material is sufficiently stable to maintain an even combustion and thereby an even flame formation. The fuel supply part 2 and the temperature control means 3 preferably form an integrated unit.

[0017] The fuel spreading slit should be less than 6 mm across to ensure a high and even flame. It should preferably be less than 3mm across and more preferable

even smaller, such as 1.5 mm or less across, and most preferable 0.5 mm across.

[0018] The depth of the fuel spreading slit should be less than 25 mm, and should preferably be about 10 mm deep.

[0019] With the dimensions mentioned above, the burner insert should be about 33 mm across, i.e. corresponding to a width of each temperature control means 3 of about 16 mm. The thickness of each temperature control means 3 may then be about 1.5 mm.

[0020] The burner insert also comprises overflow recesses 8 adjacent to the fuel spreading slit 4, Fig. 3. If there is a larger supply of fuel than the amount being burned on the insert 1, the excess fuel will flow over the slit and into one or a pair of overflow recesses. The recess is arranged adjacent to the slit 4 on one side, or a pair of recesses is arranged on each side of the slit 4. The recesses 8 lead the fuel away from the burner insert and onto a tray 10, see fig. 4. It is envisageable that the temperature control projections 3 are slightly tilted in relation to the slit 4 in the upper plane surface 9 of the fuel supply part to ensure that excess fuel does not surpass the overflow recess or recesses 8.

[0021] Fig. 4 shows a perspective view of a burner arrangement comprising the burner insert of fig. 1. It should be noted that the burner arrangement will be mounted in a fireplace and form part of the overall fireplace construction. When mounted in a fireplace, only the upper surface of the burner insert and possibly the reservoir cover and control organs will be visible in normal condition. The parts being shown at a distance from each other will be arranged a distance from each other in the fireplace. However the arrangement of each part in relation to each other should be regarded as purely illustrative as there are several practical ways to arrange e.g. the fuel reservoir in a fireplace.

[0022] The burner arrangement comprises a burner insert 1 arranged over a tray 10 acting as an overflow protection means. A fuel reservoir 14 is connected to the burner insert by means of a fuel feeding arrangement comprising fuel feeding tubes and fuel feeding means 15 such as a pump. The pump can be powered by batteries 18 or a connection to the electric network of the house housing the fireplace.

[0023] Fuel feeding tubes 11, 12 pass from the fuel reservoir 14, via the fuel feeding means 15 and further through the tray 10. The fuel feeding tube 12 passing through the tray is connected to the fuel supply channel 5 of the burner insert 1 by means of a connection sub 13. An overflow tube 16 passes from an opening in the tray to the fuel feeding tube 11 or reservoir 14, see fig. 4. If excess fuel flows over the fuel spreading slit of the burner insert, it is led via the recess or recesses towards an opening or passage towards the tray 10. The fuel will flow down onto the tray where it is led towards the opening in the tray and further into the overflow tube. This arrangement prevents excess fuel from accumulating close to the fire, where it could otherwise evaporate and cause

an uncontrolled fire. The overflow tube 16 can advantageously be provided with a reflux valve (not shown).

**[0024]** The fuel feeding arrangement is controlled by a manually or remotely controlled control device 19, Fig.

5. The control device 19 controls the flow rate in the fuel feeding arrangement. The reservoir 14 can be provided with a level sensor 20 controlling the amount of fuel in the reservoir. The level sensor 20 can be related to a signalling means signalling the need for refilling of fuel when the reservoir is being emptied. The control device 19 is also connected to an ignitor 25 located in the accommodation 7, Fig. 1.

**[0025]** The reservoir is provided with an inlet 21 for refilling of fuel. The inlet 21 should be provided with a cover (not shown) for safety reasons. In a preferred embodiment, the cover is provided with a locking means 22 that will maintain the cover locked when there is a flame present in the burner insert 1 or if the temperature of the burner insert is above a pre-defined safety level. The lock is only released when the pre-defined safety requirements are fulfilled. The locking mechanism can be an electromagnetic lock connected to sensor means 23 measuring the temperature of the burner insert and a control means locking and releasing the lock. As long as the temperature on the burner insert is above a predefined level, the lock will keep the cover closed. It will only be possible to open the cover when the burner insert has cooled down below the predefined temperature limit. The inlet 21 may also include a sensor 25 which is sensing if the cover is actually on. This is to prevent the burner being started with the cover open.

## Claims

1. Fuel insert (1), suitable for liquid fuel fireplaces, comprising a fuel supply part (2) comprising at least one fuel supply channel (5),  
**characterised in that** the fuel supply part (2) comprises an upper surface (9) comprising at least one fuel spreading slit (4) connected to the fuel supply channel (5), the fuel spreading slit (4) being cut into a substantial part of the fuel supply part (2), thereby forming a long and narrow opening in the upper surface (9), and that it comprises a temperature regulating means (3).
2. Fuel insert (1) according to claim 1, wherein said at least one fuel spreading slit (4) is 6 mm or less across, preferably less than 3 mm across, more preferable 1.5 mm or less across and most preferable 0.5 mm across.
3. Fuel insert (1) according to claim 1, wherein said at least one fuel spreading slit (4) is 25 mm or less deep and preferably 10 mm deep.
4. Fuel insert (1) according to claim 1, further compris-

ing an ignitor accommodation (7) in the vicinity of the fuel spreading slit (4), suitable for accommodating ignition means (25).

5. Fuel insert (1) according to any of the preceding claims, wherein the temperature regulating means (3) are projections in the form of integrated wings projecting away from the fuel supply part (2) of the fuel insert.
6. Fuel insert (1) according to any of the preceding claims, wherein the surface (9) comprises fuel leading means (8) adjacent to the fuel spreading slit (4) leading overflow fuel away from the burner insert (1), wherein the fuel leading means (8) is one recess or a pair of recesses arranged beside the fuel spreading slit (4) on one side or on each side of the slit, following the length of the slit.
7. Fuel insert (1) according to any of the proceeding claims, wherein the fuel insert (1) is made in a heat conducting material.
8. Burner arrangement comprising a fuel reservoir (14), a fuel feeding means (15), control means controlling the fuel feeding means (15) and a fuel ignitor (25),  
**characterised in that** it comprises a tray (10) and a fuel insert (1) according to one of the claims 1-7 arranged over the tray and which is connected to the fuel reservoir by means of fuel feeding tubes (11, 12) and the fuel feeding means (15).
9. Burner arrangement according to claim 8, further comprising an overflow tube (16) leading excess fuel from an opening in the tray (10) to a fuel feeding tube (11).
10. Burner arrangement according to claim 9, wherein the overflow tube is provided with a reflux valve.
11. Fireplace comprising a fuel insert according to any of the claims 1-7 or a burner arrangement according to any of the claims 8-10.

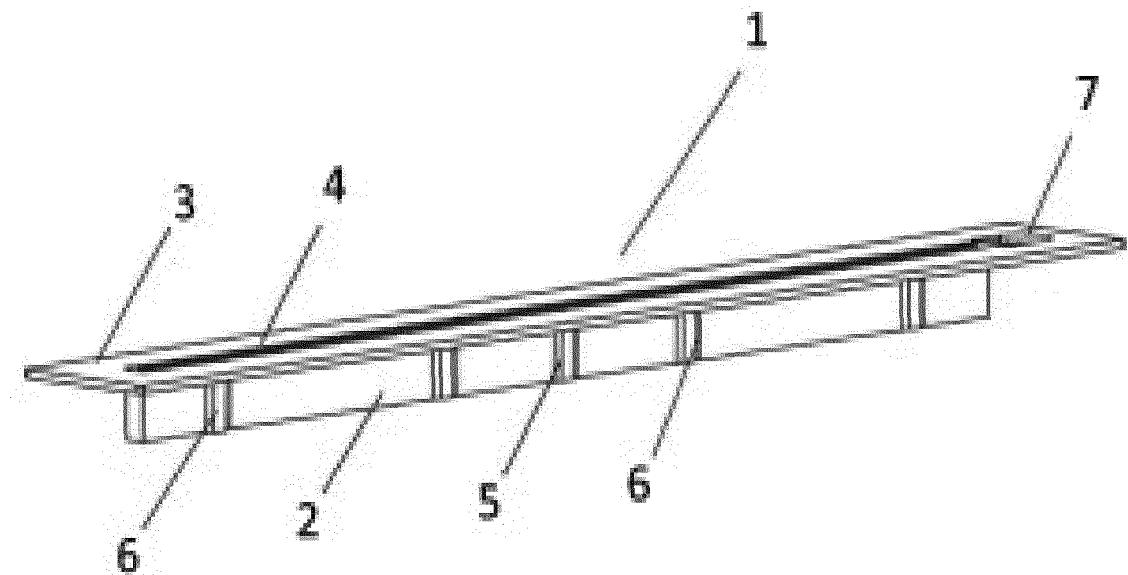


Fig. 1

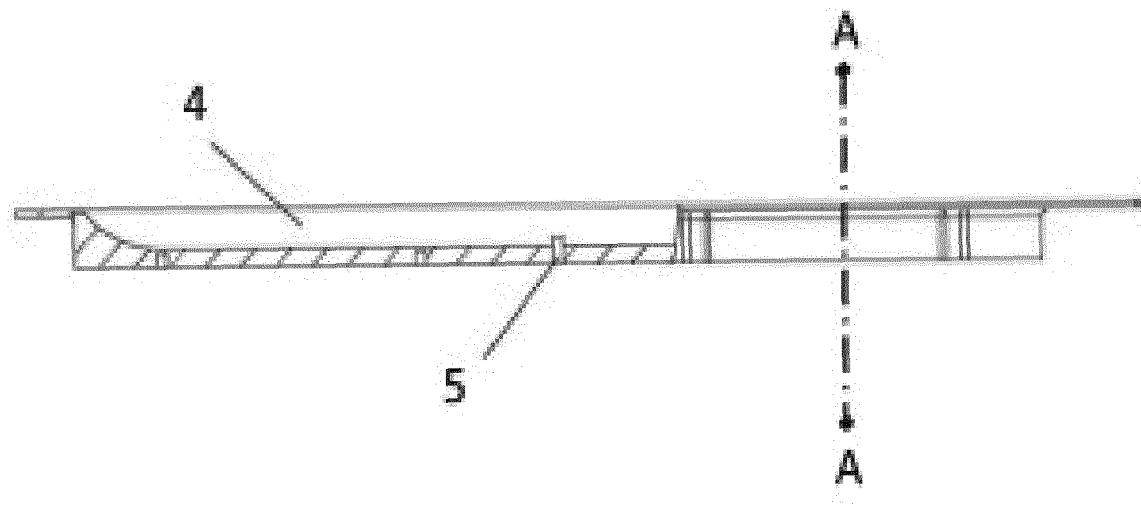


Fig. 2

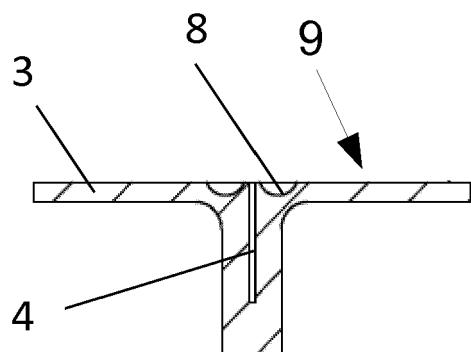


Fig. 3



Fig. 5

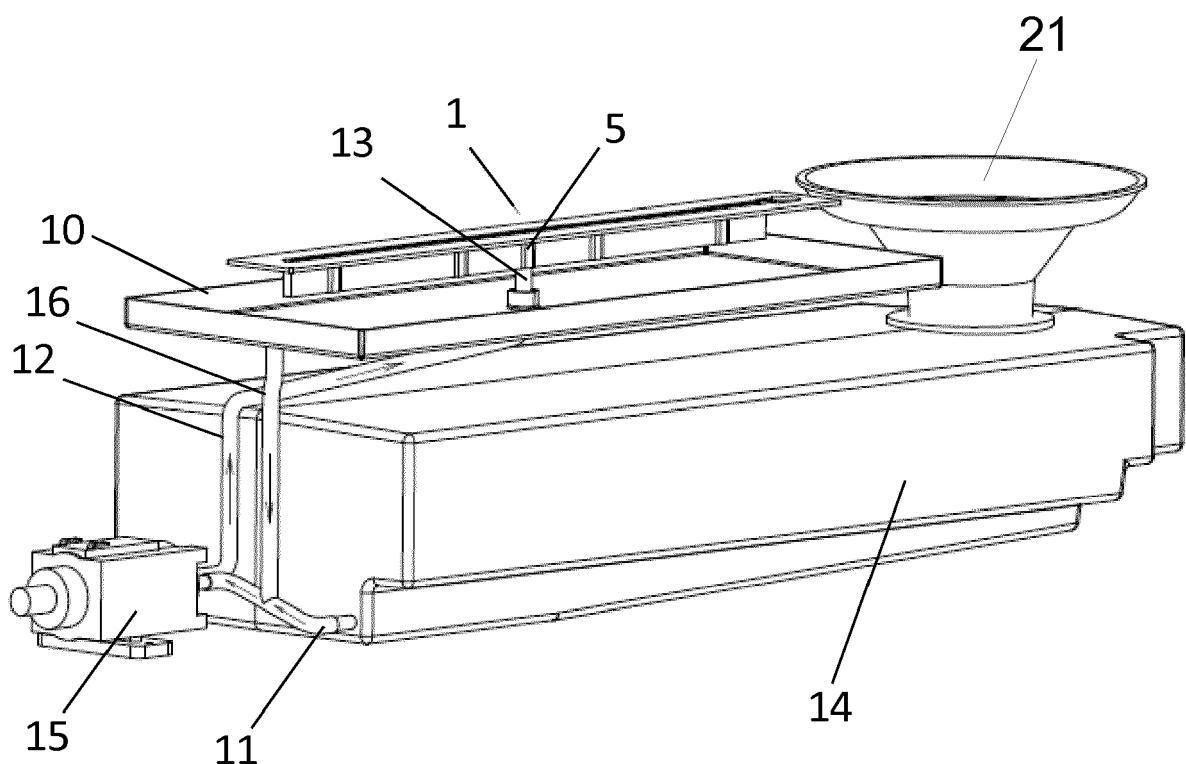


Fig. 4



## EUROPEAN SEARCH REPORT

Application Number  
EP 16 19 4021

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2008 014866 U1 (SIGER TRADING LTD [DE]) 15 April 2010 (2010-04-15) * page 2, paragraph 3 - page 6, paragraph 56 * * figures 1-6 * ----- X WO 2012/000562 A1 (SCHWOERERHAUS KG [DE]; SCHWOERER JOHANNES [DE]; SCHWOERER ROMAN [DE]) 5 January 2012 (2012-01-05) * page 15, paragraph 76 - page 21, paragraph 14 * * figures 1-7 * ----- X WO 2011/023915 A1 (SINENSYN [FR]; BRULEBOIS PIERRE-MARIE [FR]; HUANG CHUNRONG [CN]) 3 March 2011 (2011-03-03) * page 13, line 10 - page 25, line 11 * * figures 1-4 * ----- A,D EP 2 735 792 A1 (BIOPEIS AS [NO]) 28 May 2014 (2014-05-28) * the whole document * -----	1-5,7,11 1,2,5,7, 11 1,4,5,7, 11 1-11	INV. F23D5/12 F24C5/18  TECHNICAL FIELDS SEARCHED (IPC) F23D F24C
1	The present search report has been drawn up for all claims		
50	Place of search Munich	Date of completion of the search 4 April 2017	Examiner Rudolf, Andreas
55	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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EP 16 19 4021

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10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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