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HEAD ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to a head assembly for a radiant burner, an inlet assembly and a method.

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BACKGROUND

Radiant burners are known and are typically used for treating an effluent gas stream from a manufacturing process tool used in, for example, the semiconductor or flat panel display manufacturing industry. During such manufacturing, residual perfluorinated compounds (PFCs) and other compounds exist in the effluent gas stream pumped from the process tool. PFCs are difficult to remove from the effluent gas and their release into the environment is undesirable because they are known to have relatively high greenhouse activity.

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Known radiant burners use combustion to remove the PFCs and other compounds from the effluent gas stream. Typically, the effluent gas stream is a nitrogen stream containing PFCs and other compounds. A fuel gas is mixed with the effluent gas stream and that gas stream mixture is conveyed into a combustion chamber that is laterally surrounded by the exit surface of a foraminous gas burner. Fuel gas and air are simultaneously supplied to the foraminous burner to affect flameless combustion at the exit surface, with the amount of air passing through the foraminous burner being sufficient to consume not only the fuel gas supplied to the burner, but also all the combustibles in the gas stream mixture injected into the combustion chamber.

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The range of compounds present in the effluent gas stream and the flow characteristics of that effluent gas stream can vary from process tool to process tool, and so the range of fuel gas and air, together with other gases or fluids that need to be introduced into the radiant burner will also vary.

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Although techniques exist for processing the effluent gas stream, they each have their own shortcomings. Accordingly, it is desired to provide an improved technique for processing an effluent gas stream.

5 SUMMARY

According to a first aspect, there is provided a head assembly for a radiant burner, the head assembly comprising: a housing defining a plurality of identical housing apertures extending therethrough; an insulator received by the housing and defining a corresponding plurality of identical, complementarily-located
10 insulator apertures extending therethrough; and at least one inlet assembly configured to be received by one of the identical housing apertures, each inlet assembly comprising: a housing portion configured to be received by the one of the identical housing apertures; and an insulator portion configured to fill the complementarily-located insulator aperture.

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The first aspect recognises that as the range of effluent gases to be processed increases, the possible ranges of configurations for the radiant burner also increases. In particular, different types of effluent gases to be processed may be provided at different rates and in different concentrations. In order to abate or
20 process these different effluent gases, these different effluent gases may need to be distributed in different ways into the combustion chamber of the radiant burner, together with different combinations, concentrations and/or rates of other fluids such as fuel, an oxidant and any other supporting fluids such as, for example, air. These varying requirements can lead to complex engineering of
25 the head assembly and the conventional approach is to create a head assembly for each particular application. This complexity is exacerbated by the relatively small size of the radiant burner and it can become complicated to provide for all the necessary couplings and routing of the necessary conduits in order to convey, mix and/or distribute the fluids to the appropriate outlets feeding the
30 combustion chamber. The first aspect also recognises that reconfiguring existing head assemblies to meet these different requirements can be difficult and even impossible, as can be performing maintenance without completely disassembling

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the radiant burner. This can be extremely disruptive, particularly when some parts of the head assembly require more regular maintenance than others.

Accordingly, a head assembly may be provided. The head assembly may be for
5 a radiant burner. The head assembly may comprise a housing. The housing
may define or provide a plurality of housing apertures, each of which may be
identical. The housing apertures may extend through the housing. The head
assembly may also comprise an insulator. The insulator may be received by the
housing. The insulator may define or provide a corresponding plurality of
10 identical insulator apertures. Those insulator apertures may be complementarily
or co-located with the housing apertures. The insulator apertures may extend
through the insulator. The head assembly may also comprise at least one inlet
assembly. The inlet assembly may be configured or dimensioned to be received
by, or located in, one of the housing apertures. Each of the inlet assemblies may
15 comprise a housing portion. The housing portion may be configured or
dimensioned to be received by the housing aperture. The inlet assembly may
also comprise an insulator portion. The insulator portion may be shaped,
dimensioned or configured to fill or occupy the insulator aperture. In this way, a
head assembly is provided which has a number of apertures, any of which may
20 receive an inlet assembly. Given that each inlet assembly is configured to be
received by any of the apertures, this provides flexibility for the insertion and
removal of the assemblies, without needing to completely disassemble the head
assembly from the radiant burner. Also, by forming the inlet assembly with a
housing portion and insulation portion, the assembly can be located within the
25 head assembly and the insulating portion prevents heat damage.

In one embodiment, each identical housing aperture comprises a common fixing
arrangement operable to receive any one of a plurality of different inlet
assemblies, each inlet assembly having a complimentary common fixing
30 arrangement. Accordingly, each of the inlet assemblies and the housing
apertures may utilise the same complementary fixing arrangement or mechanism
to enable any differently-configured inlet assembly to be received by any of the

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apertures. Again, this provides for enormous flexibility when reconfiguring the head assembly.

5 In one embodiment, each identical housing aperture is distributed across a major face of the housing. Distributing the apertures across at least the major or main face of the housing maximises the available space around the inlet assemblies for coupling to fluid supplies.

10 In one embodiment, the housing comprises at least one other aperture extending therethrough and the insulator comprises at least one complementarily-located insulator aperture extending therethrough, the at least one other aperture being configured to receive at least one of an inner burner feed assembly, a pilot assembly, a thermocouple assembly and a sight glass assembly. Accordingly, the housing may also accommodate other assemblies necessary for the correct
15 functioning of the radiant burner.

In one embodiment, the housing portion is configured to receive at least one fluid from a corresponding fluid supply and to convey the at least one fluid to a corresponding outlet for supply to a combustion chamber of the radiant burner.
20 Accordingly, there may be a one-to-one correlation between inlets for fluids received by the inlet assembly and outlets which supply those fluids to the combustion chamber.

In one embodiment, the housing portion is configured to convey the at least one
25 fluid to a plurality of outlets for supply to a combustion chamber the radiant burner. Accordingly, some inlet assemblies may provide a one-to-many relationship between inlets for fluids received by the inlet assembly and outlets which supply those fluids to the combustion chamber in order to distribute the fluid received from an inlet to many outlets within the combustion chamber.

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In one embodiment, the housing portion is configured to receive a plurality of fluids from a corresponding plurality of fluid supplies and to convey the a plurality

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of fluids to an outlet for supply to a combustion chamber the radiant burner. Accordingly, some inlet assemblies may provide a many-to-one relationship between fluid inlets for fluids received by the inlet assembly and outlets which supply those fluids to the combustion chamber in order to combine fluids
5 provided by an outlet.

In one embodiment, the housing portion comprises at least one cleaning mechanism operable to clean a corresponding outlet. Cleaning the outlet or outlets may be necessary in order to remove accumulated deposits.

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In one embodiment, the housing defines a gallery operable to distribute fluid from the inner burner feed assembly to a plenum of the radiant burner coupleable to the head assembly. Providing a gallery or plenum is a convenient arrangement to both provide fuel and oxidant to an inner burner, as well as to a plenum
15 surrounding a foraminous burner.

In one embodiment, the housing and the insulator together define the gallery. By shaping the housing and insulator it is possible to provide the gallery. This helps to minimise the number of parts.

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In one embodiment, the housing portion is configured to extend through the gallery. Extending the housing portion through the gallery helps to ensure that no leakage from the gallery occurs.

25 In one embodiment, each outlet extends at least partially through a corresponding outlet aperture of the insulating portion. Accordingly, the outlet may fail to extend fully through the aperture of the insulating portion, may finish flush with the aperture of the insulating portion, or may extend past the aperture of the insulating portion, depending on the conditions within the combustion
30 chamber.

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In one embodiment, the insulator portion is configured to at least partially surround the outlet.

According to a second aspect, there is provided a head assembly method,
5 comprising: providing a housing defining a plurality of identical housing apertures extending therethrough; receiving an insulator by the housing, the insulator defining a corresponding plurality of identical, complementarily-located insulator apertures extending therethrough; and receiving at least one inlet assembly with one of the identical housing apertures, each inlet assembly comprising a housing
10 portion configured to be received by the one of the identical housing apertures and an insulator portion configured to fill the complementarily-located insulator aperture.

In one embodiment, the method comprises providing each identical housing
15 aperture with a common fixing arrangement operable to receive any one of a plurality of different inlet assemblies and providing each inlet assembly with a complementary common fixing arrangement.

In one embodiment, each identical housing aperture is distributed across a major
20 face of the housing.

In one embodiment, the method comprises providing the housing with at least one other aperture extending therethrough and the insulator with at least one complementarily-located insulator aperture extending therethrough and receiving
25 at least one of an inner burner feed assembly, a pilot assembly, a thermocouple assembly and a sight glass assembly in the at least one other aperture.

In one embodiment, the method comprises receiving at least one fluid from a corresponding fluid supply with the housing portion and conveying the at least
30 one fluid to a corresponding outlet for supply to a combustion chamber of the radiant burner.

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In one embodiment, the method comprises conveying the at least one fluid to a plurality of outlets for supply to a combustion chamber the radiant burner.

5 In one embodiment, the method comprises receiving a plurality of fluids from a corresponding plurality of fluid supplies with the housing portion and conveying the a plurality of fluids to an outlet for supply to a combustion chamber the radiant burner.

10 In one embodiment, the method comprises providing at least one cleaning mechanism with the housing portion to clean a corresponding outlet.

In one embodiment, the method comprises defining a gallery with the housing to distribute fluid from the inner burner feed assembly to a plenum of the radiant burner coupleable to the head assembly.

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In one embodiment, the housing and the insulator together define the gallery.

In one embodiment, the method comprises extending the housing portion through the gallery.

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In one embodiment, the method comprises extending each outlet at least partially through a corresponding outlet aperture of the insulating portion.

25 In one embodiment, the method comprises at least partially surrounding the outlet with the insulator portion.

30 According to a third aspect, there is provided an inlet assembly configured to be received by one of identical housing apertures of a housing of a head assembly for a radiant burner, the inlet assembly comprising: a housing portion configured to be received by the one of the identical housing apertures; and an insulator portion configured to fill a complementarily-located insulator aperture of an insulator received by the housing.

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In one embodiment, the inlet assembly comprises a complimentary common fixing arrangement operable to be received by a common fixing arrangement of each identical housing aperture.

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In one embodiment, the housing portion is configured to receive at least one fluid from a corresponding fluid supply and to convey the at least one fluid to a corresponding outlet for supply to a combustion chamber of the radiant burner.

10 In one embodiment, the housing portion is configured to convey the at least one fluid to a plurality of outlets for supply to a combustion chamber the radiant burner.

15 In one embodiment, the housing portion is configured to receive a plurality of fluids from a corresponding plurality of fluid supplies and to convey the a plurality of fluids to an outlet for supply to a combustion chamber the radiant burner.

In one embodiment, the housing portion comprises at least one cleaning mechanism operable to clean a corresponding outlet.

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In one embodiment, the housing portion is configured to extend through a gallery defined by the housing to distribute fluid from an inner burner feed assembly to a plenum of the radiant burner coupleable to the head assembly.

25 In one embodiment, each outlet extends at least partially through a corresponding outlet aperture of the insulating portion.

In one embodiment, the insulator portion is configured to at least partially surround the outlet.

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Further particular and preferred aspects are set out in the accompanying independent and dependent claims. Features of the dependent claims may be

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combined with features of the independent claims as appropriate, and in combinations other than those explicitly set out in the claims.

Where an apparatus feature is described as being operable to provide a function,
5 it will be appreciated that this includes an apparatus feature which provides that function or which is adapted or configured to provide that function.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described further, with
10 reference to the accompanying drawings, in which:

Figure 1 illustrates a head assembly for a radiant burner according to one embodiment;

Figures 2A and 2B illustrate the head assembly of Figure 1 but with one inlet assembly removed;

15 Figures 3A and 3B illustrate an inlet assembly according to one embodiment; and Figures 4A and 4B illustrate an inlet assembly according to one embodiment.

DESCRIPTION OF THE EMBODIMENTS

Overview

20 Before discussing the embodiments in any more detail, first an overview will be provided. A head assembly is provided which utilises a basic, preconfigured structure into which various different or identical inlet assemblies may be received. This provides for a flexible head assembly configuration which can be easily reconfigured to suit the processing or abatement of effluent gas streams
25 from multiple different sources, and which can enable individual inlet assemblies to be removed for maintenance, when required. Providing such a modular approach gives significant operational and cost advantages.

Head Assembly

30 Figure 1 illustrates a head assembly, generally 10, for a radiant burner according to one embodiment. Radiant burners are well known in the art, such as that described in EP 0 694 735. The head assembly comprises three main sets of

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components. The first is a metallic (typically steel) housing 20, which provides the necessary mechanical strength and configuration for coupling with the remainder of the radiant burner (not shown). The second is an insulator 30 which is provided within the housing 20 and which helps to reduce heat loss from within a combustion chamber (not shown) of the radiant burner, as well as to protect the housing 20 and items coupled thereto from the heat generated within the combustion chamber. The third are inlet assemblies 50 which are received by a series of identical, standardized apertures 40 (see Figure 2A) provided in the housing 20. These inlet assemblies 50 may be provided with different configurations of inlets and outlets, or with other features, in order to suit different effluent gas abatement or processing requirements and to support the functioning of the radiant burner. However, each of the different inlet assemblies 50 is configured to fit with each of the apertures 40. This provides the flexibility to maintain a consistent configuration into which different inlet assemblies may be fitted, as required. Also, this arrangement enables individual inlet assemblies 50 to be removed for maintenance, without needing to remove or disassemble the complete head assembly 10 from the remainder of the radiant burner.

The embodiment shown in Figure 1 utilises six identical inlet assemblies 50, each mounted within a corresponding one of six apertures 40. However, it will be appreciated that any one or more of the inlet assemblies 50 may have a different configuration, provided that they can still be received within the aperture 40. Also, it will be appreciated that not every aperture 40 may be filled with an inlet assembly 50 which receives an effluent or process fluid, or other fluid, and may instead receive a blanking inlet assembly to completely fill the aperture 40, or may instead receive an instrumentation inlet assembly housing sensors in order to monitor the conditions within the radiant burner. Also, it will be appreciated that greater or fewer than six apertures 40 may be provided, that these need not be located circumferentially around the housing, and that they need not be located symmetrically either.

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As can also be seen in Figure 1, additional apertures are provided in the housing 20 in order to provide for other items such as, for example, a feed 60 for an inner burner 60A (see Figure 2B), a sight glass 70 and a feed 75 for a pilot 75A (see Figure 2B).

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Figures 2A and 2B illustrate the head assembly of Figure 1, but with one of the inlet assemblies removed.

As can be seen in more detail in Figure 2B (which is an underside view of the head assembly), the insulator 30 is provided with apertures 40A which align with the apertures 40. Although in this embodiment the apertures 40A are the same diameter as those apertures 40 extending through the housing 20, it will be appreciated that this need not be the case and that they may be smaller. Also, although this arrangement shows the two apertures 40, 40A arranged co-axially, it will be appreciated that this again need not be the case and that they may be axially offset. In such an arrangement it would be preferable for the height of a gallery (mentioned in more detail below) to be greater than the height of an insulator portion of the inlet assembly (mentioned in more detail below) or for the insulator portion to be smaller than the housing portion (mentioned in more detail below) and 'under its shadow' (i.e. the insulator portion extends no further radially than the housing portion).

The inlet assemblies 50 are retained using suitable fixings such as, for example, bolts (not shown) which are removed in order to facilitate their removal. As can also be seen in Figure 2A, one internal major surface of the housing 20 is spaced away from an opposing major surface of the insulator 30 to create a gallery through which fluids may be conveyed. In this embodiment, the gallery couples with the feed 60 of the inner burner 60A in order to convey fuel and oxidant via the apertures 80 into a plenum (not shown) surrounding a foraminous gas burner (not shown) of the radiant burner.

Inlet Assembly

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An effluent or process gas stream is provided via an inlet 100 of the inlet assembly 50 and is conveyed to each of three outlets 120. An actuator 160 is provided which activates a cleaning mechanism to remove deposits from within the outlets 120. The inlet assembly 50 comprises a housing portion and an insulator portion. The housing portion is generally metallic and provides the required mechanical strength for fixing the inlet assembly 50 to the housing 20 and for supporting the coupling of the necessary conduits which supply the fluid and also to support the operation of mechanisms within the inlet assembly 50. The housing portion is generally received within the aperture 40 which falls within the housing and gallery, if present. The insulator portion is generally received within the aperture 40A provided by the insulator 30. The fit between the outer surface of the insulator portion and the surface of the aperture 40A provided by the insulator 30 should be sufficiently tight to prevent heat from damaging the housing portion. If the gallery is present, the fit between the insulator portion and the aperture 40A provided by the insulator 30 needs to be good, otherwise some of the fluid that flows through the gallery will leak directly into the combustion chamber without passing through the (outer) foraminous burner; suitable sealing means should be provided at the cold end of the insulator portion to prevent this. In one embodiment, a deformable component is provided between the housing portion and insulator portion, which is larger in diameter than the aperture 40A and is deformably received within the aperture 40A. The housing portion and the insulating portion are held together by fixings (not shown) located within fixing apertures (not shown), which are then sealed using a temperature resistant sealant.

Figures 3A and 3B illustrate an inlet assembly 50A according to one embodiment. As shown in Figure 3A, an effluent or process gas stream is provided via an inlet 100A and is conveyed to at least one process stream outlet (not shown). Air is received via an air inlet 125 and is conveyed via an air modulating valve 130 to air outlets (not shown) which concentrically surround the process stream outlets. An actuator 160A is provided which activates a cleaning mechanism (not shown) to remove deposits from within the outlets. The inlet assembly 50A comprises a

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housing portion, generally 165A, and an insulator portion, generally 170A. The housing portion 165A is generally metallic and provides the required mechanical strength for fixing the inlet assembly 50A to the housing 20 and for supporting the coupling of the necessary conduits which supply the fluid and also to support the operation of mechanisms within the inlet assembly 50A. The housing portion 165A is generally received within that part of the aperture 40 which falls within the housing and gallery, if present. The insulator portion 170A is generally received within that portion of the aperture 40A provided by the insulator 30. The fit between the outer surface of the insulator portion 170A and the surface of the aperture 40A provided by the insulator 30 should be sufficiently tight to prevent heat from damaging the housing portion 165A. A deformable component 163A is provided between the housing portion and insulator portion, which is larger in diameter than the aperture 40A and is deformably received within the aperture 40A. The housing portion 165A and the insulating portion 170A are held together by fixings (not shown).

As can be seen in Figure 3B, which illustrates a section through the inlet assembly 50A, an effluent or process gas stream is provided via the inlet 100A and is conveyed via a chamber 110 to each of the three outlets 120A. Air is received via the air inlet (not shown) and is conveyed via the modulating valve 130 and a chamber 140 to the three outlets 150A which concentrically surround the outlets 120A. The actuator 160A activates a cleaning mechanism 170 to remove deposits from within the outlets 120A. The inlet assembly 50A comprises a housing portion, generally 165A, and an insulator portion, generally 170A. The housing portion 165A and the insulating portion 170A are held together by fixings (not shown) located within fixing apertures 180, which are then sealed using a temperature-resistant sealant.

Figures 4A and 4B illustrate an inlet assembly 50B according to one embodiment. As shown in Figure 4A, which illustrates a section through the inlet assembly 50B, an effluent or process gas stream is provided via an inlet 100B and is conveyed via a chamber 110B to each of the three outlets 120B. An actuator

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160B is provided which activates a cleaning mechanism 172 to remove deposits from within the outlets 120B. The inlet assembly 50B comprises a housing portion, generally 165B, and an insulator portion, generally 170B. The housing portion 165B is generally metallic and provides the required mechanical strength for fixing the inlet assembly 50B to the housing 20 and for supporting the coupling of the necessary conduits which supply the fluid and also to support the operation of mechanisms within the inlet assembly 50B. The housing portion 165B is generally received within that part of the aperture 40 which falls within the housing and gallery, if present. The insulator portion 170B is generally received within that portion of the aperture 40A provided by the insulator 30. The fit between the outer surface of the insulator portion 170B and the surface of the aperture 40A provided by the insulator 30 should be sufficiently tight to prevent heat from damaging the housing portion 165B. A deformable component 163B is provided between the housing portion and insulator portion, which is larger in diameter than the aperture 40A and is deformably received within the aperture 40A. The housing portion 165B and the insulating portion 170B are held together by fixings (not shown) located within fixing apertures 180B, which are then sealed using a temperature-resistant sealant.

Accordingly, it can be seen that embodiments recognise that combustion of semiconductor waste gases often requires different configuration of the inlets to give optimal destruction of the gases. Ordinarily, in a system comprising at least a combustion chamber and an inlet head assembly, the configuration is fixed at the time of manufacture. Field upgrade (to accommodate process change or inaccurate specification) may well involve the complete exchange of the inlet head assembly. In extreme cases, non-standard parts may need to be manufactured.

Embodiments also recognise that it would be advantageous to have available an arrangement where the function of closing off the combustion chamber (and additional support functions such as pilot, flame management) is performed by one substantial assembly. In addition, each of the process inlets would be

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introduced as a functionally complete sub-assembly, allowing the system to be configured and re-configured at will.

Embodiments also recognise that a secondary advantage would be that for inlet
5 maintenance procedures, only the respective inlet(s) would need to be removed,
not the whole head assembly. For larger systems with heavy parts (such as
systems designed for high flows seen in flat panel/solar processing and
anticipated for 450mm silicon wafer processing) this dramatically simplifies the
cleaning process.

10 The burner system comprises a combustion chamber, such as, but not limited to,
for example, a foraminous burner as described in US5,510,093, open at both
ends. The upper end is closed off by a metal flange of a head assembly
according to embodiments. This has a lining of a cast ceramic fibre or other
15 refractory material attached to it to act as a thermal insulator, protecting the
metallic part(s) from thermal damage and minimising the thermal losses from the
system. This flange may carry the pilot burner, thermocouple, sight glass and
other features as necessary for the operation of the burner. A number of large
ports are cut through the flange and the ceramic insulator so as to form passages
20 directly into the combustion chamber. Into these ports or passages, the
individual inlet assemblies are fitted.

The head assembly comprises an inlet pipe, a plenum and a plurality of inlet
nozzles, through which the process gases flow into the combustion chamber. The
25 underside of the inlet plenum is fitted with a ceramic insulator in like manner to
the inlet head. This insulator substantially fills the passageway in the inlet head,
preventing the egress of hot gases from the combustion chamber. Elastomer
seals may be fitted at the "cold" end between the flange and the plenum to make
the assembly gas tight.

30 Note that different materials may be used for the inlets and the head flange, as
only the inlets are in contact with process gases. For example, the inlets may be

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fashioned from a stainless steel, whereas the head flange may be an aluminium alloy.

The inlets may take a variety of forms for example a plurality of simple nozzles as
5 described in US 5,510,093, or nozzles with co-axial lances arranged for the
supply of O₂, with additional fuel pre-mixed into the process gas stream as
described in EP 0802370, or nozzles with a concentric passage and a co-axial
lance as described in WO 2006/013355, or simple nozzles with large concentric
excess air passages for combustion of process gases with a high H₂ component.

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The inlet nozzles may be separate from the plenums or cast together in one
piece. In one piece, the plenum and nozzles may be cast from a high
temperature alloy such as ANC16 (equivalent to Inconel 600) or ANC5
(equivalent to SS310) depending on requirements.

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The lower end of the combustion chamber forms the outlet, through which
combusted gases discharge to receive further treatment, such as air cooling,
water cooling, wet scrubbing etc., as currently practised.

20 Although embodiments relate to a burner with an annular combustion chamber, it
will be appreciated that is equally applicable to other forms of combustor.

It will be appreciated that separating the inlet function from the head (combustion
chamber closing) function enables inlets to be separately removable. This in turn
25 results in the option to fit any such inlet as required without the need to disturb
other inlets or the head.

Although illustrative embodiments of the invention have been disclosed in detail
herein, with reference to the accompanying drawings, it is understood that the
30 invention is not limited to the precise embodiment and that various changes and
modifications can be effected therein by one skilled in the art without departing

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from the scope of the invention as defined by the appended claims and their equivalents.

CLAIMS

1. A head assembly for a radiant burner, said head assembly comprising:
a housing defining a plurality of identical housing apertures extending
5 therethrough;
an insulator received by said housing and defining a corresponding
plurality of identical, complimentarily-located insulator apertures extending
therethrough; and
at least one inlet assembly configured to be received by one of said
10 identical housing apertures, each inlet assembly comprising:
a housing portion configured to be received by said one of said
identical housing apertures; and
an insulator portion configured to fill said complimentarily-located
insulator aperture.
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2. The head assembly of claim 1, wherein each identical housing aperture
comprises a common fixing arrangement operable to receive any one of a
plurality of different inlet assemblies, each inlet assembly having a
complimentary common fixing arrangement.
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3. The head assembly of claim 1 or 2, wherein each identical housing
aperture is distributed across a major face of said housing.
4. The head assembly of any preceding claim, wherein said housing
25 comprises at least one other aperture extending therethrough and said
insulator comprises at least one complimentarily-located insulator aperture
extending therethrough, said at least one other aperture being configured
to receive at least one of an inner burner feed assembly, a pilot assembly,
a thermocouple assembly and a sight glass assembly.
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5. The head assembly of any preceding claim, wherein said housing portion
is configured to receive at least one fluid from a corresponding fluid supply

and to convey said at least one fluid to a corresponding outlet for supply to a combustion chamber of said radiant burner.

- 5 6. The head assembly of any preceding claim, wherein said housing portion is configured to convey said at least one fluid to a plurality of outlets for supply to a combustion chamber said radiant burner.
- 10 7. The head assembly of any preceding claim, wherein said housing portion is configured to receive a plurality of fluids from a corresponding plurality of fluid supplies and to convey said a plurality of fluids to an outlet for supply to a combustion chamber said radiant burner.
- 15 8. The head assembly of any preceding claim, wherein said housing portion comprises at least one cleaning mechanism operable to clean a corresponding outlet.
- 20 9. The head assembly of any preceding claim, wherein said housing defines a gallery operable to distribute fluid from said inner burner feed assembly to a plenum of said radiant burner coupleable to said head assembly.
10. The head assembly of claim 9, wherein said housing and said insulator together define said gallery.
- 25 11. The head assembly of claim 9 or 10, wherein said housing portion is configured to extend through said gallery.
12. The head assembly of any preceding claim, wherein each outlet extends at least partially through a corresponding outlet aperture of said insulating portion.
- 30 13. The head assembly of any preceding claim, wherein said insulator portion is configured to at least partially surround said outlet.

14. A head assembly method, comprising:
 - providing a housing defining a plurality of identical housing apertures extending therethrough;
 - 5 receiving an insulator by said housing, said insulator defining a corresponding plurality of identical, complimentarily-located insulator apertures extending therethrough; and
 - receiving at least one inlet assembly with one of said identical housing apertures, each inlet assembly comprising a housing portion configured to
 - 10 be received by said one of said identical housing apertures and an insulator portion configured to fill said complimentarily-located insulator aperture.