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⑪ Publication number:

0 039 572
A1

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EUROPEAN PATENT APPLICATION

⑰ Application number: **81301870.2**

⑸ Int. Cl.³: **F 24 C 1/10, F 24 C 3/08,**
F 24 D 5/08

⑱ Date of filing: **28.04.81**

⑳ Priority: **29.04.80 GB 8014058**

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④ Date of publication of application: **11.11.81**
Bulletin 81/45

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⑥ Designated Contracting States: **AT BE CH DE FR GB IT**
LI LU NL SE

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⑤ **Radiant heater.**

⑤ This invention relates to a radiant heater comprising gas fired combustion means, at least two interconnected heating tubes arranged to receive products of combustion from said combustion means to pass sequentially through said tubes, and interconnecting means extending transversely of said tubes and towards an extremity of at least one of said tubes, the arrangement being such that each tube has an extension portion terminating in closure means to allow periodic access for cleaning the tube.

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DESCRIPTION

The present invention relates to industrial heaters and particularly to radiant heaters using a gaseous fuel.

5 A popular and efficient form of industrial and commercial heater, particularly under adverse draught conditions is a radiant tube heater. Such a heater comprises a tube having one end to which a negative pressure is applied for example as by a centrifugal fan and having the other end attached
10 to or placed immediately adjacent a combustion chamber and fan assembly. Air for combustion is drawn through the burner unit thence through the tube and consequently the tube is heated by the combustion gases, spent gases exhausting through
15 the centrifugal fan which may also be used to dilute products of combustion to an acceptable level.

An arrangement such as this has been disclosed in British Patent No. 1,315,685 and has been found
20 generally satisfactory in operation.

We have now found, however, that equally good results can be obtained by incorporating a fan into the burner unit and thus providing a more compact and economic unit.

According to the present invention, therefore, there is provided a radiant heater comprising gas fired combustion means, at least two interconnected heating tubes arranged to receive products of combustion from said combustion means to pass sequentially through said tubes, and interconnecting means extending transversely of said tubes and towards an extremity of at least one of said tubes, the arrangement being such that each tube has an extension portion terminating in closure means to allow periodic access for cleaning the tube.

In one embodiment of the invention, the combustion means may be additionally arranged to induce a positive pressure within said first tube thereby to assist the products of combustion to flow about the heating tube and to exhaust to the atmosphere by the other end of said second tube.

In a preferred embodiment of the invention a plug or cover is provided in each of said tubes to allow internal cleaning of the tubes as a maintenance operation. It is most preferred that with the cover in place a small space remains in use between the internal surface of the cover and the adjacent boundary layer formed by the heat exchange fluid. Preferably the space is formed by a coaxial

extension of each of said tubes in a direction
away from the burner unit, which may include a
fan, said cover being externally screwthreaded,
and adapted to cooperate with a corresponding
5 internal screw thread in said coaxial extension.

In radiant heaters of the general type
disclosed herein it is normal to provide some
means of limiting upward convection and radiation
of the heat generated and to this end either an
10 insulating layer has been disposed over the
radiant heating tubes or a shaped deflector as
in British Patent No. 1,315,685 is provided.

It has not been found necessary or desirable to
combine a reflector with an insulating layer.
15 However, with the increasing cost of fuel it
becomes more necessary to ensure that all heat is
directed to the places that it is really required.
Another problem has been that it is difficult to
fix an insulating layer to a shaped reflector
20 shield, because of the inherent differences in
their thermal expansion.

According to another aspect of the invention,
there is provided, therefore, a combined reflector
and insulative shield which comprises a shaped
25 metal shield adapted for use with a radiant heater,
said shield being formed of a shaped metal sheet

having adhesively sprayed thereupon a coating of an insulative material the physical properties of the insulative layer being such that it remains adhesively bonded to the shield at all operating
5 temperatures.

The physical properties may be the elasticity of the insulative material or it may be that the thermal expansion coefficient of the insulative material is sufficiently akin to that of the shield
10 over the range of temperatures used that no undue stress is placed upon the adhesive bonding.

In a preferred form the metal shield is formed into an approximate semi-circular shape, the insulative layer being sprayed onto the convex
15 sides thereof, such that its maximum thickness is toward the median line of the elongate shield.

The invention will now be described, by way of illustration only, with reference to the accompanying drawings wherein:-

20 Figure 1 is a transverse cross-section through a heating pipe in accord with the invention.

Figure 2 is a vertical cross-section through a heating apparatus according to the invention along the line A:A of Figure 1.

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Figure 3 is a transverse cross-section similar to that of Figure 1 but wherein the conjoining pipe is curved.

Radiant heater tubes of the present invention
5 comprise in one aspect as shown in Figure 1 a substantially H-shaped radiant heating tube comprising a tube portion 1 conjoining tube portion 2 and final tube portion 3.

A combined burner unit associated with a
10 positive pressure inducing fan is supplied as at 5; the burner unit supplying the products of combustion at a positive pressure into the tube 1. The products of combustion flow from the portion 1 via portion 2 and the portion 3 to the exterior at 6.
15 During the passage of the combustion gases as described, heat is transferred to the walls 1 which are constituted by a nominal 2 inch gas pipe and irradiated from the walls thereof.

After some use a build up of solid products of
20 combustion will take place within the tube and it is thus necessary to clean the internal bores thereof as a matter of maintenance. To this end the plugs 4 and 4' are provided, these being removed with a screwdriver and suitable brush being introduced into
25 the bores. The members 4 and 4' are replaced before the burner unit 5 is restarted. It will be noted in

this connection that the plugs 4 are set back from the path followed by the heating fluid in pipes 1 and 3. The provision of a small space between the bottom or internal edge of the plug 4 and the boundary layer formed by the heat exchange fluid flowing from pipe 1 to pipe 2 for example, ensures that this boundary layer is not interfered with by the proximity of plug 4 and hence prevents any increase in turbulence that would thereby be caused.

10 Turbulence is, of course, to be avoided in apparatus of this type since it leads to ununiform heating.

 Furthermore, the presence of the small "dead leg" at the extremity of pipe 1 ensures a buffer of gas therein and reduces the effect of the direct impingement of combustion gases upon plug 4.

 The device of Figure 1 is similar in all respects to Figure 1 except that the conjoining tube 2' is somewhat curved to assist fluid flow. Although not shown, it is in some applications desirable to provide a plug or cover in either the portion 1 or 3 coaxial with the conjoining tube 2 so that a brush may be introduced perpendicularly to the axis of elongate heating tubes to clean the conjoining tube.

25 In such an arrangement, of course, the plugs should be set back from the wall of the heating tube.

In Figure 2 a vertical cross-section through a shield and radiant heating assembly is shown. Members 1, 2 and 3 have been described hereinbefore, and the shield which is disposed thereover in use is comprised of a metal sheet 7 bent into a substantially semi-circular configuration having three planar faces. An insulative layer 8 is sprayed onto the convex face thereof such that the insulative layer has its maximum thickness immediately adjacent the heating tubes 1 and 3 when in situ. The insulative layer is selected such that it will key onto the shield 7 and such that it is slightly elastic so that as the shield 7 expands under heat the insulative layer does not become detached therefrom.

It will be appreciated, therefore that the present invention includes a radiant heater having a combined burner and fan unit disposed adjacent the inlet to said tube, a burner unit comprising a combined insulative and heat-reflecting shield, and to a method for the improved maintenance of radiant heating tubes which comprises providing removable covers at portions of the tube so that a brush may be introduced to clean the internal bore thereof.

CLAIMS:-

1. A radiant heater comprising gas fired combustion means, at least two interconnected heating tubes arranged to receive products of combustion from said combustion means to pass sequentially through
5 said tubes, and interconnecting means extending transversely of said tubes and towards an extremity of at least one of said tubes, the arrangement being such that each tube has an extension portion terminating in closure means to allow periodic access
10 for cleaning the tube.
2. A heater as claimed in claim 1 wherein the combustion means includes means for inducing positive pressure within the heating tubes to assist the passage of products of combustion therethrough for
15 exhaust to the atmosphere.
3. A heater as claimed in either of the preceding claims wherein the closure means is disposed in an extension of each tube from the interconnecting portion thereby maintaining the closure means remote
20 from the main flow path of combustion products within the apparatus.

4. A heater as claimed in any preceding claim
wherein a reflector is provided over said heating
tubes, the surface of the reflector being provided
with an insulating layer on the side thereof remote
5 from the tubes.

5. A heater as claimed in claim 4 wherein the
reflector comprises a shaped metal shield adapted
for use with the heater, said shield being formed
of a shaped metal sheet having adhesively sprayed
10 thereon a layer of insulating material with
physical properties of the insulative layer being
such as to remain adhesively bonded to the shield
at operating temperatures.

6. A heater as claimed in claim 5 wherein the
15 shield is of arcuate cross-section and the insulative
layer is sprayed on the convex side thereof.

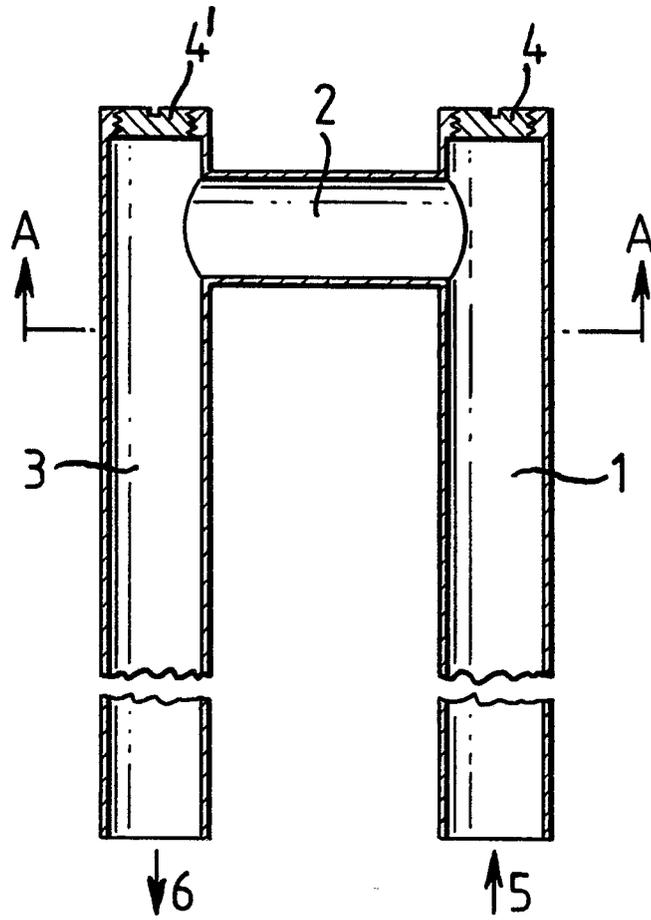


FIG. 1

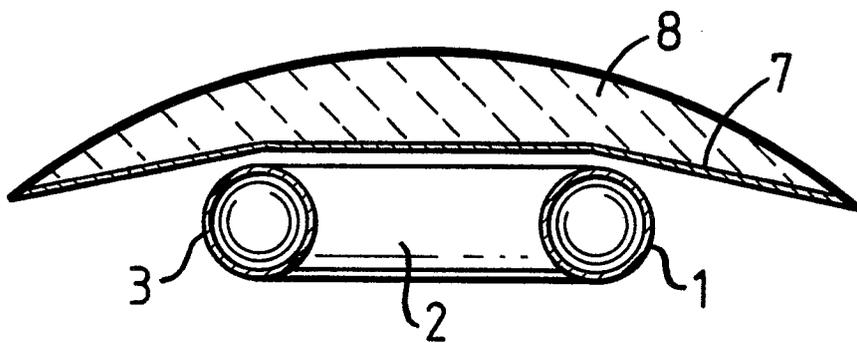


FIG. 2

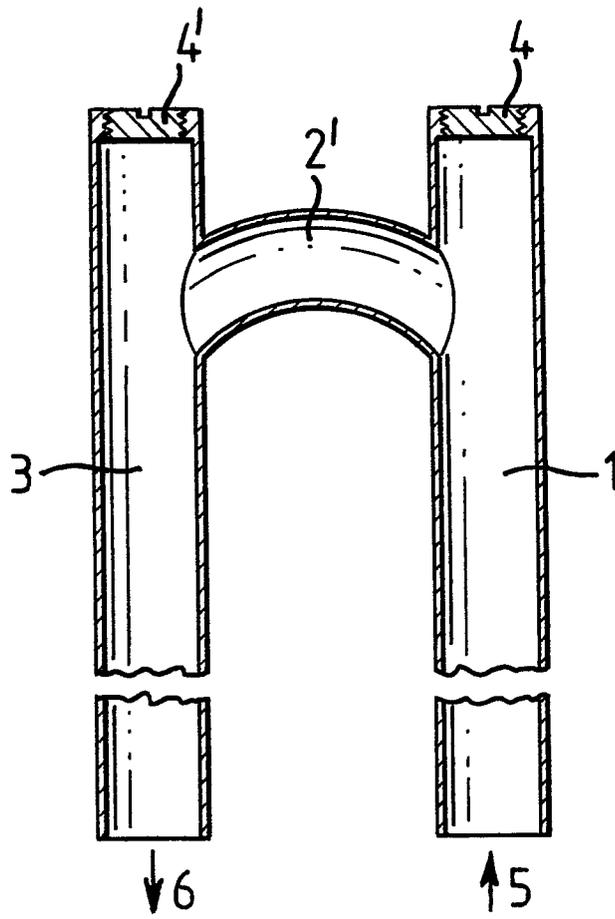


FIG. 3



| DOCUMENTS CONSIDERED TO BE RELEVANT | | | CLASSIFICATION OF THE APPLICATION (Int. Cl. ³) |
|---|--|---|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | |
| | <p><u>BE - A - 337 721 (BARKER)</u> * Pages 5,6; claims; figure: *</p> <p>--</p> <p><u>GB - A - 502 112 (GIBBONS)</u> * Page 5, lines 70-76; figure 2 *</p> <p>--</p> <p><u>FR - A - 2 404 812 (GRUNZWEIG)</u> * Page 4, lines 16-18; figures 11,12 *</p> <p>--</p> <p><u>FR - A - 2 270 529 (RADIANT TUBE)</u> * Page 4, lines 6-16; page 8, lines 27-35; figures 1,3 * & GB - A - 1 448 073</p> <p>-----</p> | <p>1,2</p> <p>1</p> <p>1,4</p> <p>1,2,4</p> | <p>F 24 C 1/10 F 24 C 3/08 F 24 D 5/08</p> |
| | | | TECHNICAL FIELDS SEARCHED (Int. Cl. ³) |
| | | | <p>F 24 C F 24 D F 23 C F 28 G</p> |
| | | | CATEGORY OF CITED DOCUMENTS |
| | | | <p>X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons</p> |
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| <p><input checked="" type="checkbox"/> The present search report has been drawn up for all claims</p> | | | |
| Place of search | Date of completion of the search | Examiner | |
| The Hague | 05-08-1981 | VANHEUSDEN | |