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(54) Infra-red heating system.

(57) An infra-red heating system comprises a heating pipe 2 and a plurality of combustion devices 3 (one only shown) spaced apart along the pipe 2. The combustion devices are connected in parallel to the pipe 2 by respective connecting pipes 4 through which hot gases are supplied to the interior of the pipe 2 to cause the pipe to emit infra-red radiation. The structure of the combustion devices including the burner heads 10 thereof is disposed remotely from the interior of the pipe 2 and does not interfere with gas flow along the pipe 2.

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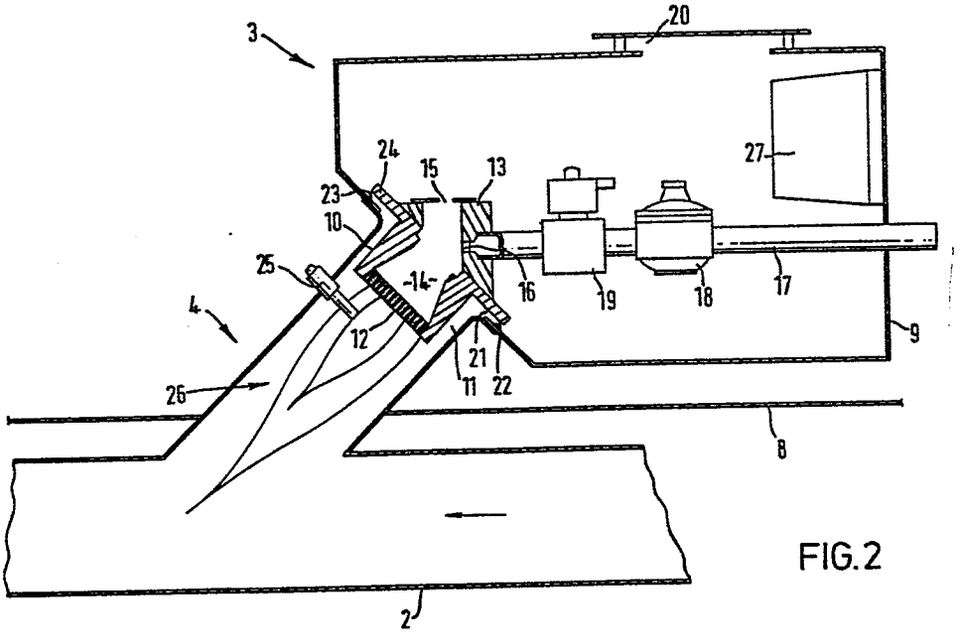

FIG.2

INFRA-RED HEATING SYSTEM

This invention relates to an infra-red heating system comprising a heating pipe and a plurality of combustion devices spaced apart along the heating pipe for supplying hot gases into the interior of the pipe to cause the pipe to emit infra-red radiation.

Such systems are known from UK Patent Specifications Nos. 1120504, 2070227 and 2102555 to which reference is hereby directed. In the systems disclosed in the above-mentioned specifications each combustion device comprises a burner head which is disposed in the flow of gases along the heating pipe. This has a disadvantageous effect on the flow of gases along the pipe.

An object of the present invention is to provide an infra-red heating system in which none of the structure of the combustion devices interferes with the flow of hot gases along the heating pipe.

In accordance with the present invention, there is provided an infra red heating system comprising a heating pipe and a plurality of combustion devices spaced apart along the heating pipe and connected in parallel thereto by respective connecting pipes for supplying hot gases to the interior of the heating pipe.

The system may include reflector means arranged to be disposed above the heating pipe in use for reflecting heat therefrom downwards, said connecting pipes

extending through the reflector means and the reflector means extending between the heating pipe and the combustion devices.

Preferably each combustion device comprises a burner head which extends into the connecting pipe and which defines therewith an annular gap for introducing carrier air into the system.

Advantageously, the inlet to said annular gap is defined between respective radial surfaces connected to the burner head and the connecting pipe, said inlet being adjustable by movement of the burner head axially relative to the connecting pipe.

In order that the invention may be well understood, an embodiment thereof, which is given by way of example only, will now be described, reference being made to the accompanying drawings in which:

Figure 1 is a schematic diagram of an infra-red heating system; and

Figure 2 is an enlarged vertical cross-section of part of the heating system showing in detail a combustion device thereof.

Referring first to Figure 1 there is shown an infra-red heating system 1 comprising a heating pipe 2 and a plurality of combustion devices 3 spaced apart along the heating pipe and connected in parallel thereto by respective connecting pipes 4 for supplying hot gases to the interior of the heating pipe 2. One end 5 of the heating pipe is closed and the other end 6 is connected to a suction means 7, such as a fan or pump, which causes gas flow along the heating pipe. The heating pipe emits infra-red radiant heat from its surface and a reflector means comprising an elongate reflecting element 8 disposed above the heating pipe and along its length reflects heat emitted from the heating pipe downwards. As illustrated, the connecting pipes 4 extend through the reflecting element 8, the latter extending between the heating pipe 2 and the combustion devices 3.

Whilst in Figure 1 the system comprises a single heating pipe and that pipe defines straight-line flow path, it will be appreciated that the heating pipe may define a U-shape flow path, in which case the pipe will comprise two parallel runs each of which is connected to the other at one end only. Furthermore, the heating system may comprise a plurality of heating pipes 2, each having a plurality of combustion devices 3 spaced therealong, the heating pipes being connected in parallel to a common suction means for causing gas flow along the heating pipes.

The structure of the combustion devices and their connection to the heating pipe will now be described in more detail referring to Figure 2 which shows one such combustion device. The other combustion devices are of identical construction.

Combustion device 3 comprises a housing 9 which is mounted to one end of the connecting pipe 4 which connects the device 3 to the heating pipe 2. The combustion device comprises a burner head 10 which extends into the connecting pipe 4 and which defines therewith an annular gap 11 for introducing carrier air into the system. The burner head is circular in cross-section and is provided with a plurality of burner ports 12. Within the burner head 10 and a mixing block 13 mounted thereon is defined a mixing chamber 14 for mixing air and gas prior to combustion. The mixing chamber 14 is provided with an air inlet orifice 15 for admitting air from the housing 9 into the mixing chamber 14 and a gas inlet orifice 16 for admitting gas to the chamber 14 from a gas supply line 17 which extends through the housing and includes within the housing a zero governor 18 and a solenoid valve 19 for use in controlling gas flow to the chamber 14.

The housing itself is provided with an air inlet

20 and the air admitted into the interior of the housing therethrough forms both the air for combustion and the carrier air. The latter is supplied to the annular gap 11 through an inlet 21 to the annular gap which is defined between respective radial surfaces 22,23 connected to the burner head and connecting pipe. These radial surfaces are provided by a radial flange 24 of the burner head and a facing portion of the housing connected to the end of the connecting pipe. The size of inlet 21 is adjustable by movement of the burner head relative to the connecting pipe to either reduce or increase the spacing apart of the surfaces 22,23. To this end, the burner head is mounted in the connecting pipe so as to be movable relative thereto to a selected position.

It will be appreciated that the size of inlet 21 will be determined by the rating of the combustion device and would be preset accordingly during manufacture. Provision for adjusting the size of the inlet during manufacture therefore facilitates manufacture of combustion devices of different ratings.

An igniter 25 is mounted downstream of the burner head 10 for igniting the gas/air combustion mixture flowing through the burner ports. The igniter is mounted on the wall of the connecting pipe 4 and extends therethrough. The connecting pipe 4 acts as a 'flame tube' for the combustion device and the flame from the burner head is schematically illustrated at 26.

A controller 27 mounted within the housing controls operation of the igniter 25 and solenoid valve 19 in a manner which will be obvious to the man skilled in the art and which needs no further explanation here.

A particular advantage of the illustrated combustion device, is that the carrier air which is drawn into the connecting pipe 4 around the burner head 10 acts to

cool the connecting pipe 4 above the reflector element 8 to avoid loss of radiant heat. If desired the connecting pipe can also be insulated above the reflector element.

It will be appreciated from the foregoing that the structure of the combustion devices including the burner heads thereof is disposed remotely from the interior of the heating pipe and does not interfere with gas flow therealong. Furthermore it will be noted that by connecting the combustion devices in parallel to the heating pipe rather than in series therewith as in the systems disclosed in the patent specifications referred to above, a simpler construction is achieved.

CLAIMS:

1. An infra-red heating system comprising a heating pipe and a plurality of combustion devices spaced apart along the heating pipe and connected in parallel thereto by respective connecting pipes for supplying hot gases to the interior of the heating pipe.

2. A heating system as claimed in claim 1, including reflector means arranged to be disposed above the heating pipe in use for reflecting heat therefrom downwards, said connecting pipes extending through the reflector means and the reflector means extending between the heating pipe and the combustion devices.

3. A heating system as claimed in claim 1 or 2, wherein each combustion device comprises a burner head which extends into the connecting pipe and which defines therewith an annular gap for introducing carrier air into the system.

4. A heating system as claimed in claim 3, wherein the inlet to said annular gap is defined between respective radial surfaces connected to the burner head and the connecting pipe, said inlet being adjustable by movement of the burner head axially relative to the connecting pipe.

5. A heating system as claimed in any one of the preceding claims, comprising a single said heating pipe connected to a suction means for causing gas flow along the pipe.

6. A heating system as claimed in claim 5, wherein said heating pipe defines a straight-line flow path.

7. A heating system as claimed in claim 5, wherein said heating pipe defines a U-shape flow path.

8. A heating system as claimed in any one of claims 1 to 4, comprising a plurality of said heating pipes, each having a plurality of said combustion devices spaced therealong, said heating pipes being connected in parallel to a common suction means for causing gas flow along said pipes.

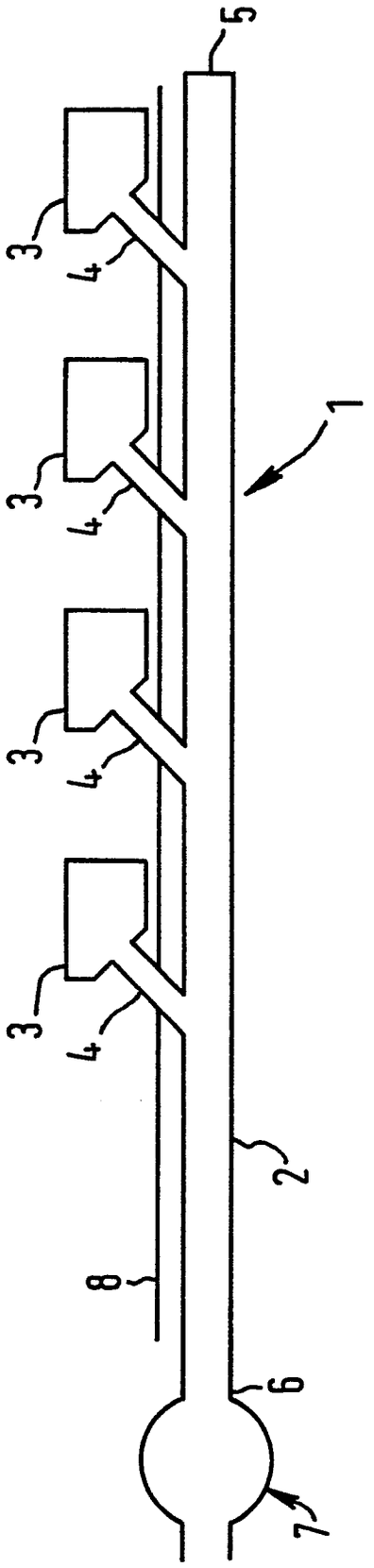

FIG. 1

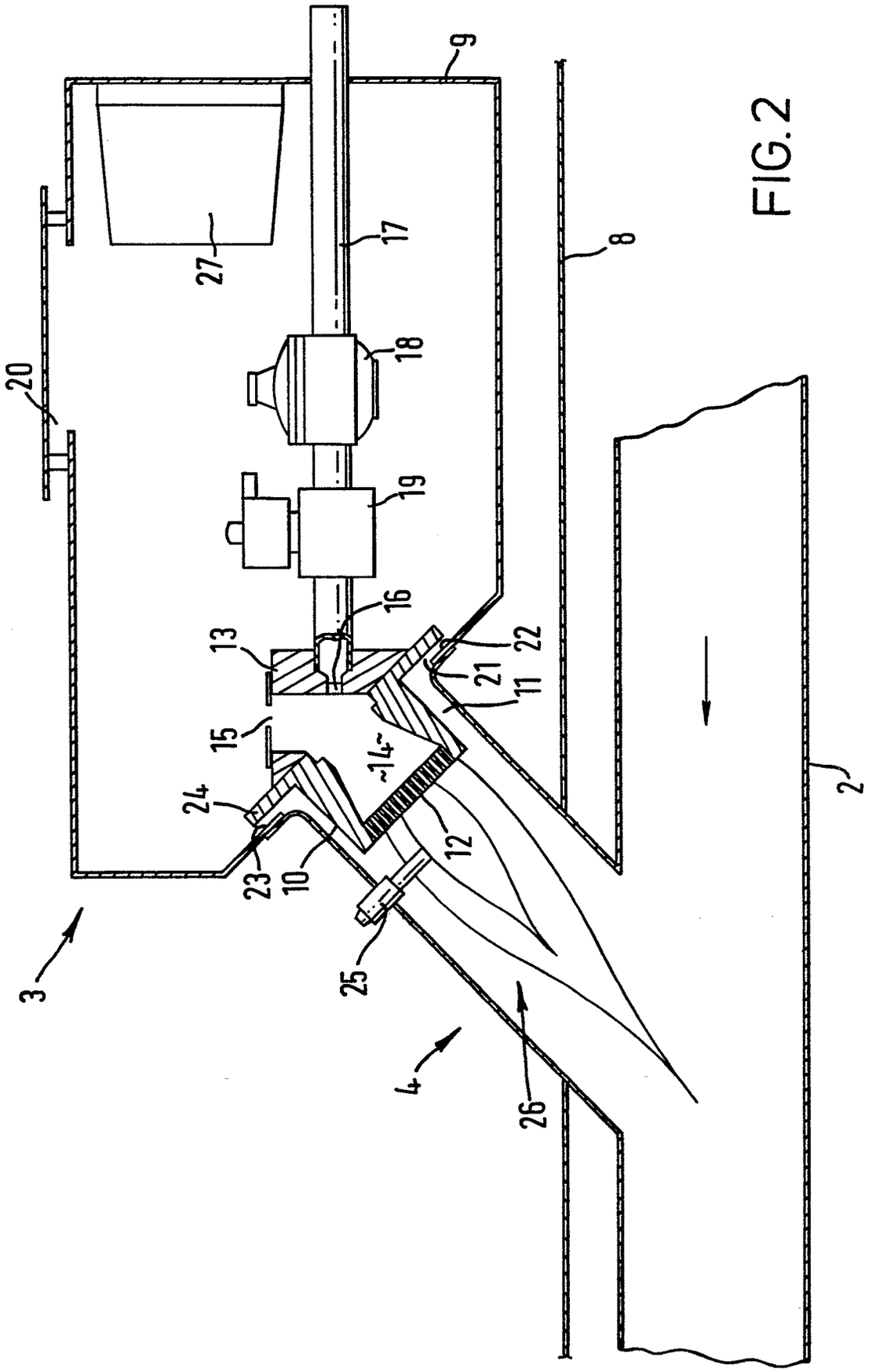

FIG.2