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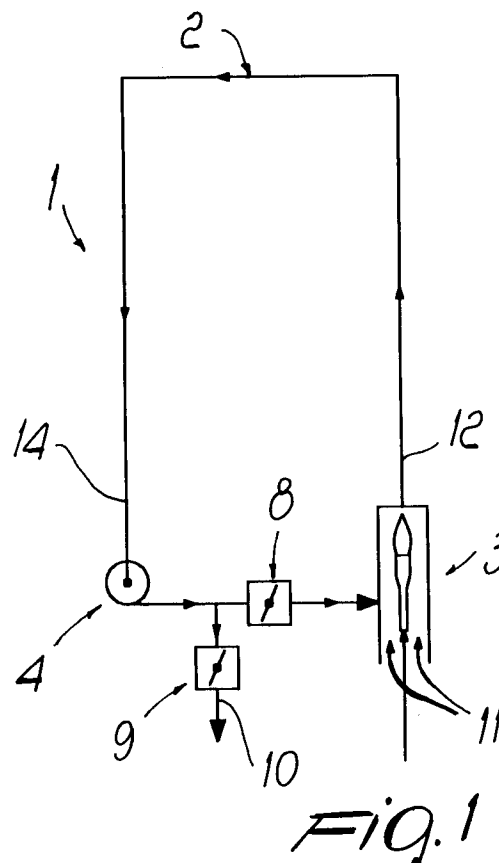
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12.04.95 Bulletin 95/15(72) Inventor: **Fraccaro, Gimmi****Via Sile 34****I-31033 Castelfranco Veneto (IT)**(84) Designated Contracting States:
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Via Sile, Z.I. 32**(54) **Device for heating enclosed spaces.**

(57) The device (1) for heating enclosed spaces comprises at least one closed-circuit pipeline (2), which is arranged above the enclosed space to be heated and acts by heat radiation, a burner (3), and a fan (4). The burner (3) is of the atmospheric-pressure type and the fan (4) injects air, drawn from the pipeline (2), laterally to the burner (3).

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The present invention relates to a device for heating enclosed spaces, such as aircraft hangars, theaters, movie theaters, high-rise warehouses, and buildings used for commerce, industry and handicraft, which are usually tall and have large surface areas.

Systems are known for this purpose that comprise a closed circuit composed of multiple pipelines which are arranged approximately at the roof or ceiling of the enclosed space; warm air is circulated inside these pipelines.

The heating effect is achieved by radiation from the surface of said pipelines towards the floor by suitable insulating reflecting screens.

A system of this type is described in Italian patent no. 1,037,880, which includes a burner located directly at the pipeline and a fan for feeding the gaseous heating medium through the pipeline; the fan is located upstream or downstream of the burner.

The burner is of the blast type and is inserted at the pipeline, which has the configuration of a closed loop.

This solution has a drawback: the use of air-blast burners in fact produces a preset pressure in the pipeline, and this pressure requires continuous and accurate maintenance, which must be performed by extremely qualified individuals, to check for any loss from said pipeline.

Furthermore, the use of air-blast gas burners requires the manufacture of devices which are complicated from a structural point of view and are difficult to optimize; the large number of moving mechanical parts makes the device prone to breakages, and thus to considerable maintenance, and entails high overall costs.

An aim of the present invention is therefore to solve the described technical problems, eliminating the drawbacks of the described prior art and thus providing a device that allows to heat enclosed spaces by radiation and has high-level safety characteristics for its users.

Within the scope of this aim, an important object is to provide a device that has very low manufacturing and maintenance costs.

Another object is to provide a device that is simple to set up, has a limited number of moving mechanical parts, and allows the use of personnel that is not particularly trained or qualified.

Another object is to provide a device for heating enclosed spaces by radiation which has very low installation costs and is reliable and safe in use.

With the foregoing and other objects in view, there is provided a device as defined in the appended claims.

Further characteristics and advantages of the invention will become apparent from the detailed

description of a particular embodiment, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figures 1 and 2 are schematic views of the components of the device;

figure 3 is a sectional view of the fan of the burner;

figure 4 is a sectional view, taken along the plane IV-IV of figure 3;

figure 5 is a schematic view of the use of an air-stream burner.

With reference to the above figures, the reference numeral 1 generally designates the heating device for enclosed spaces with any surface extension; said device comprises at least one pipeline, designated by the reference numeral 2, which forms a closed circuit that has the desired configuration according to the dimensions of the enclosed space.

The device furthermore comprises an atmospheric multiple-flame Venturi-tube or air-stream burner designated by the reference numeral 3.

The device is furthermore constituted by a fan, designated by the reference numeral 4, which is interposed at the pipeline 2 in a region that is adjacent to the burner 3 and is preferably contained together with said burner in a suitable containment element 5 that has an appropriate insulation 6.

The fan 4 thus draws the burnt gas and sends it into a suitable chamber 7 arranged laterally to the burner 3; downstream of said burner, the combustion gas and the flame, which contains a certain amount of air drawn from outside and of burnt air, mix and allow to obtain a high-temperature gaseous fluid without the aid of heat exchangers.

Preferably, a first gate valve 8 for adjusting the air flow-rate is inserted between the fan 4 and the burner 3.

The fan 4 furthermore has a second gate valve 9 for adjusting the discharge of fumes at a suitable discharge duct 10.

Of course there is a very specific ratio in the mixing of the air that circulates inside the pipeline 2, of the product of combustion, and of the flame of the atmospheric gas burner, since the mixed amount of air and gas required for combustion is equal to the amount of combustion gas that leaves the discharge duct 10.

In this way, in this device primary air, generally designated by the reference numeral 11, enters the burner 3 due to the negative pressure produced by the jets of pressurized combustible gas inside one or more Venturi-tube burners and due to the negative pressure produced by the fan 4 on the feed duct 12 that is associated with said burner.

As shown in figures 1 and 2, the discharge duct 10 can furthermore be arranged at the fan 4

or between the fan and the burner 3.

Furthermore, as shown in figures 3 and 4, advantageously the suction inlet 13 of the fan 4 is located approximately at the center of the return duct 14.

As shown in figure 5, an air-stream burner 3 is used wherein the air and burnt gas mixture is introduced laterally.

Air is fed upstream of the fan 4 by means of a third gate valve 15.

The dimensions of the device can be limited in this solution, too, by providing the fan and the burner in a single unit.

It has thus been observed that the invention has achieved the intended aim and objects a device having been provided that allows to heat enclosed spaces by radiation with extremely high user safety characteristics, since the pipeline is at negative pressure and thus does not release into the environment any toxic fumes due to accidental leaks or breakages.

The possibility of providing in a single unit the fan and the burner, which is of the Venturi-tube atmospheric type or of the air-stream type, allows to place said unit in any point outside the enclosed space, due to its limited dimensions with respect to known systems that have equal capabilities.

Its simple construction furthermore allows rapid and easy maintenance, which can be performed even by personnel that is not particularly trained and thus with very low manufacturing, installation, and management costs.

As regards the field of application, the described solution can be used to heat a furnace, for example of the tunnel type.

The dimensions and the materials that constitute the individual components of the device may of course be the most pertinent according to the specific requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Device for heating enclosed spaces, comprising at least one closed-circuit pipeline, which acts by heat radiation, a burner, and a fan, characterized in that said burner is of the multiple-flame atmospheric-pressure type with Venturi tubes and in that said fan injects air, drawn from said pipeline, laterally to said burner.
2. Device according to claim 1, characterized in that said atmospheric multiple-flame burner with Venturi tubes is located in a region that is adjacent to said fan.
3. Device according to claims 1 and 2, characterized in that said burner and said fan are located at a same containment element that has an appropriate insulation.
4. Device according to claims 1 and 3, characterized in that said fan draws the burnt gas from said pipeline and sends it to a suitable chamber which is located laterally to said burner, the combustion gases and the flame, which contains a certain amount of air drawn from outside and of burnt air, mixing downstream of said burner.
5. Device according to one or more of the preceding claims, characterized in that said Venturi-tube burner, of the atmospheric or air-stream type, produces a negative pressure that allows to draw primary air from outside.
6. Device according to one or more of the preceding claims, characterized in that it comprises a first gate valve which is interposed between said fan and said burner or between said burner and a second gate valve that is connected to a discharge duct.
7. Device according to claims 1 and 6, characterized in that said discharge duct is located at said fan or between said burner and said fan.
8. Device according to one or more of the preceding claims, characterized in that it comprises at least one pipe, at least one air-stream or atmospheric Venturi-tube or air-stream burner which has a lateral chamber to which the return duct of said at least one pipeline can be connected.
9. Device according to one or more of the preceding claims, characterized in that said fan has a suction inlet located approximately at the center of the return duct of said at least one pipeline.
10. Device according to one or more of the preceding claims, characterized in that said burner has a preheater for heating the comburent air which is suitable to increase thermal efficiency.
11. Device according to one or more of the preceding claims, characterized in that said air-

stream burner laterally receives a mixture of air and burnt gases, said air being drawn upstream of said fan.

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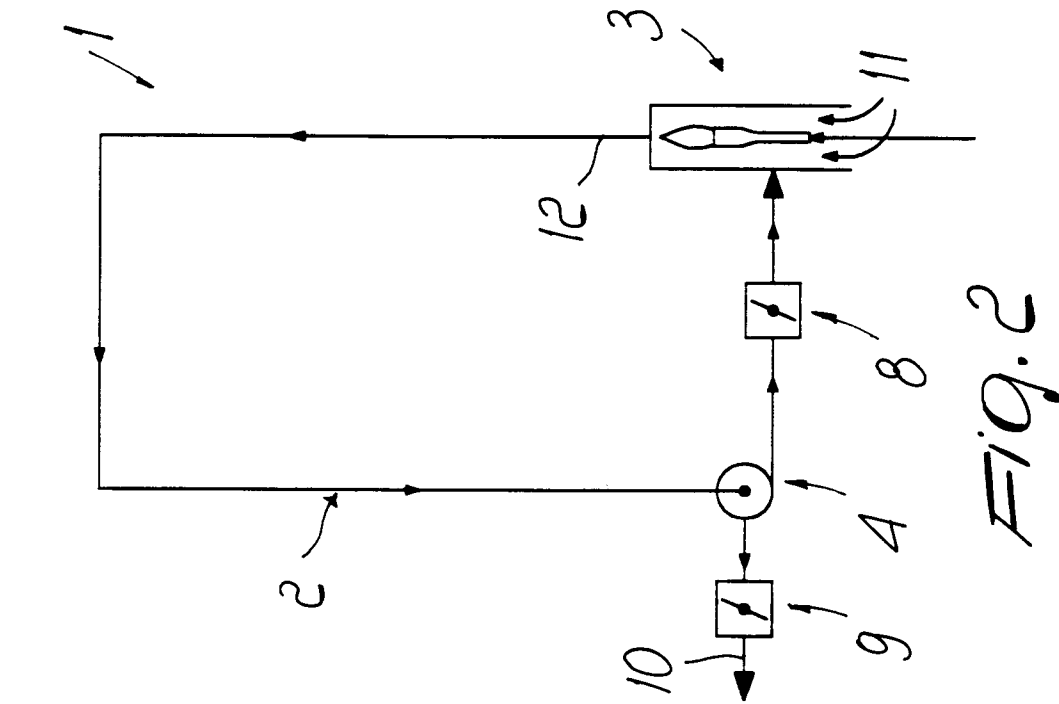


Fig. 2

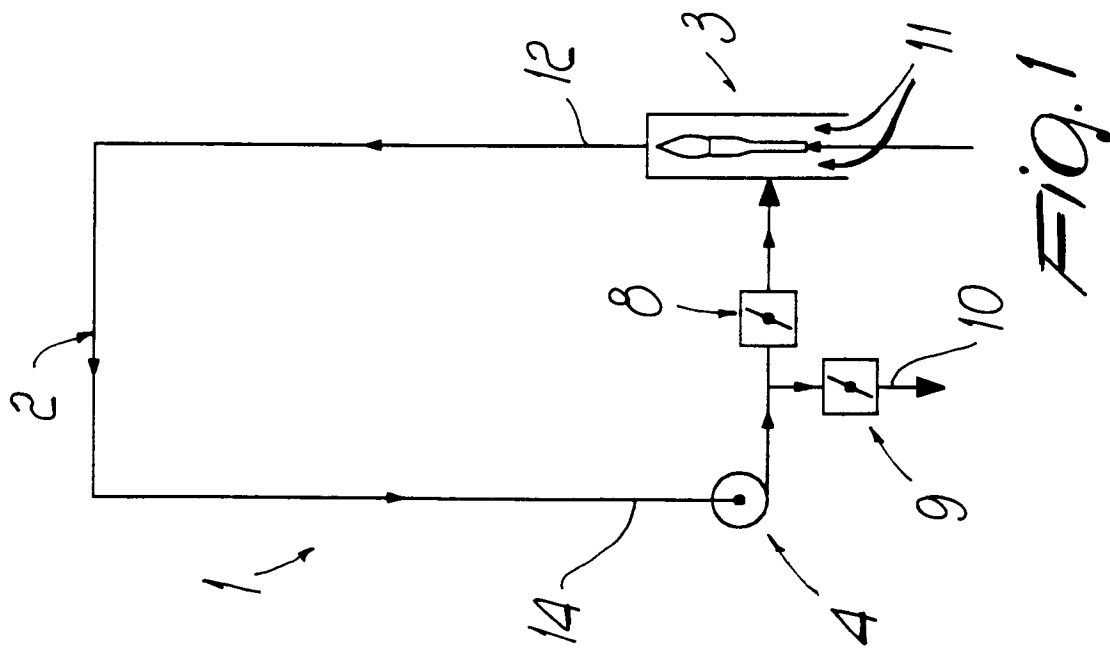


Fig. 1

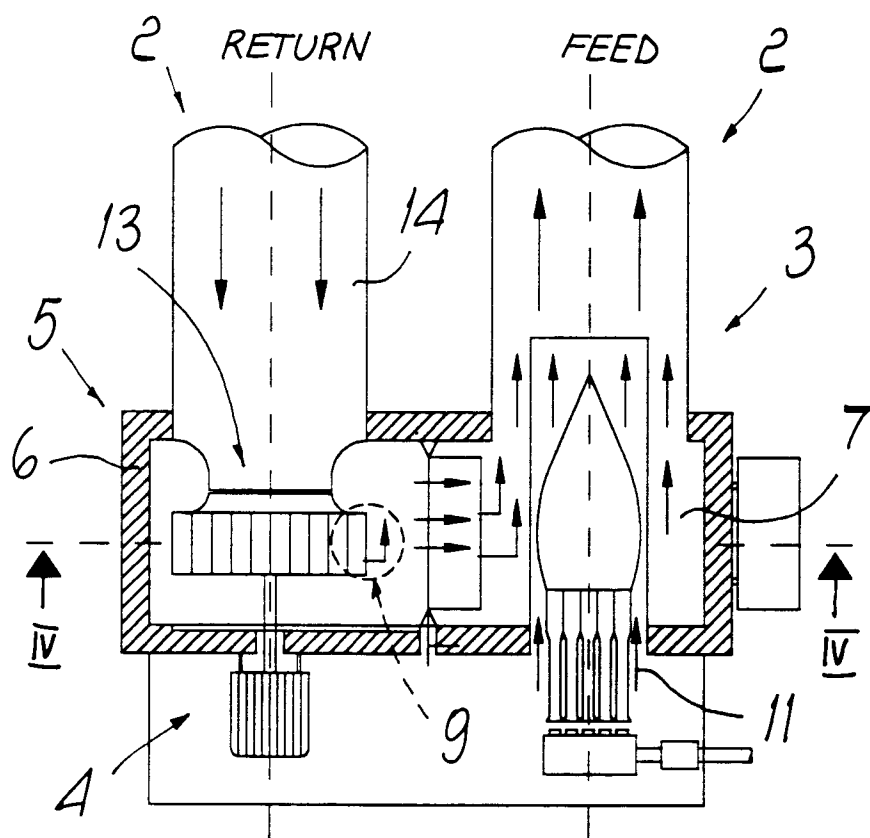


Fig. 3

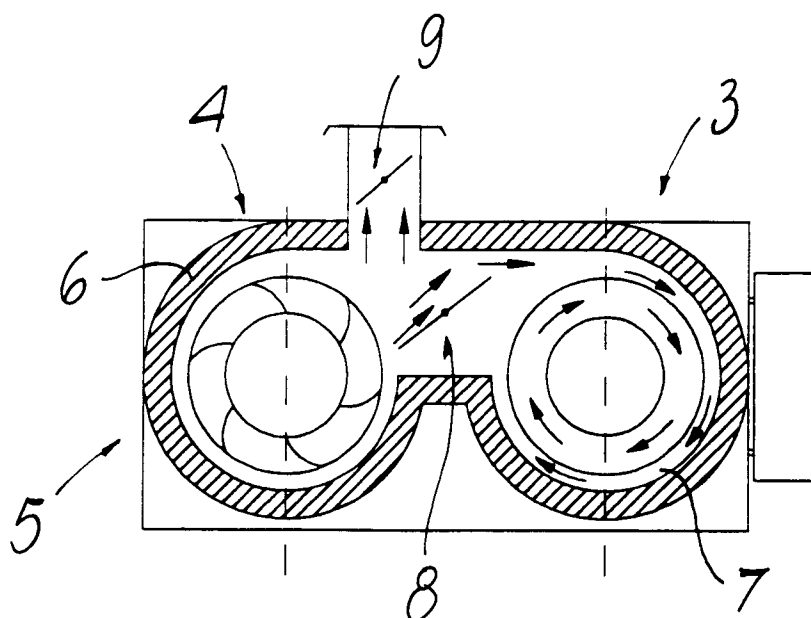
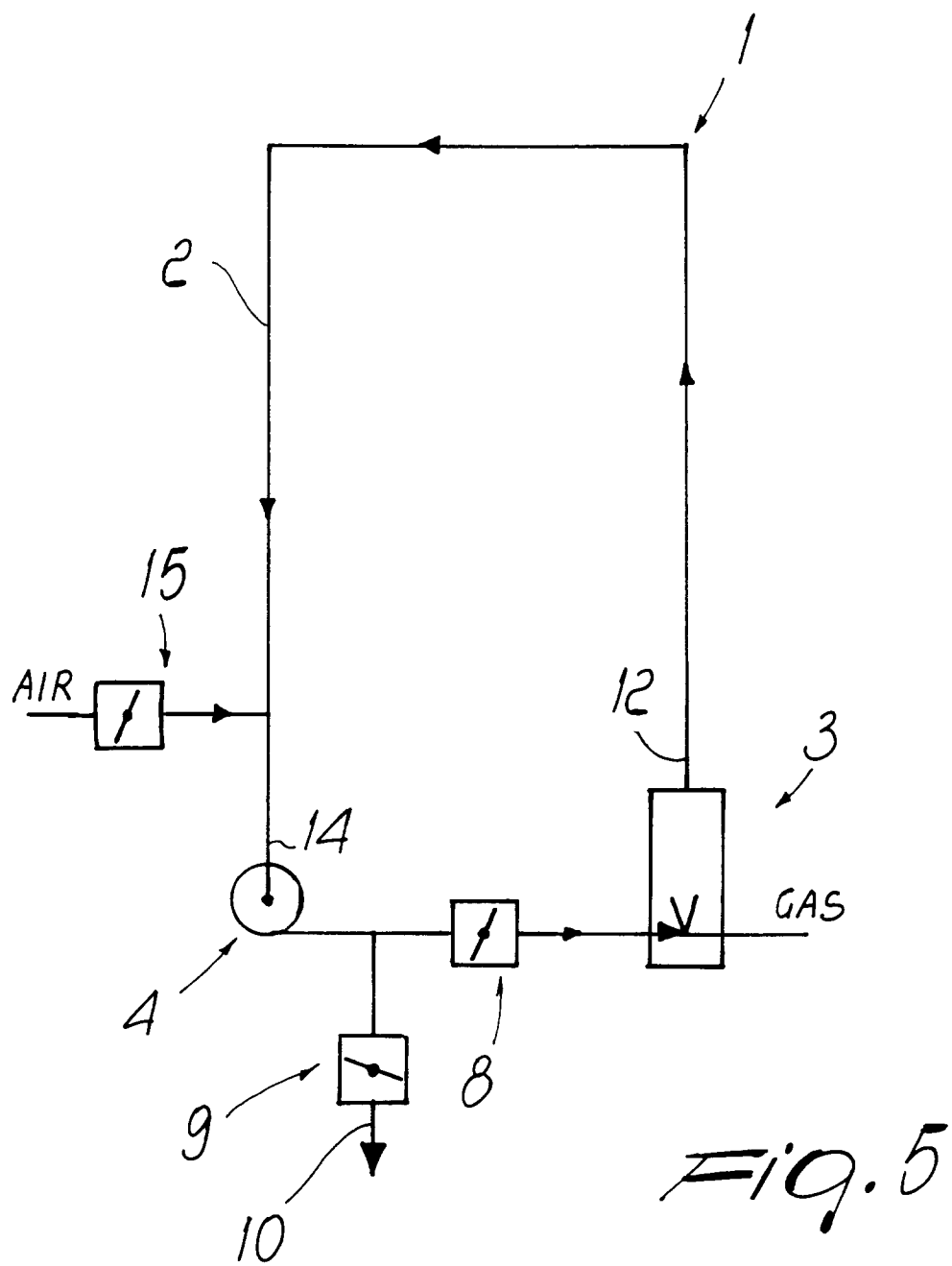


Fig. 4





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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 5945

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 079 526 (G + H MONTAGE GMBH) * the whole document * ---	1-4, 7, 8	F24D5/08
X	EP-A-0 503 489 (PENDER STRAHLINGSHEIZUNG GMBH) * the whole document * ---	1-11	
X	FR-A-606 020 (PIERSON) * the whole document * ---	1	
A	EP-A-0 509 155 (NOR-RAY-VAC LIMITED) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F24D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 January 1995	Examiner Van Gestel, H
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			