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(54) Burner installation

(57) A burner installation includes a burner housing (1), a burner mounted in the burner housing, and a burner flame monitoring device (14) for detecting the presence of a flame in the burner. The monitoring device (14) is able to provide a signal indicating the presence of the flame in the burner, the monitoring device being detachably mounted on the burner housing (1). A magnet (22) and sensor (17) for detecting the proximity of the magnet are provided. One of the magnet (22) and sensor (17) is secured in fixed relationship to the monitoring device (14) and the other of the magnet and sensor is secured in fixed relationship to the burner housing (1), whereby the sensor (17) is able to detect if the monitoring device (14) is detached from the burner housing.

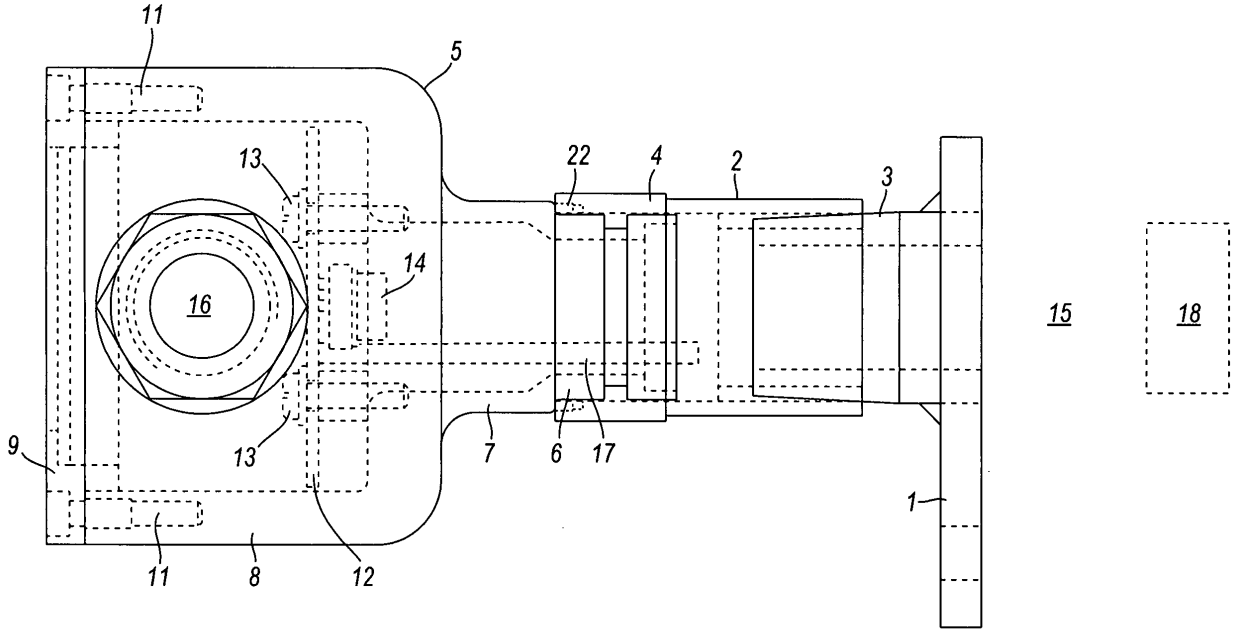

Fig.1

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Description

[0001] The present invention relates to a burner installation and more particularly to a burner installation including a burner flame monitoring device. Such a burner installation may, for example, be of the kind used in an industrial boiler.

[0002] In order to monitor for the presence of a flame in a burner, it is known to provide a sensor to check for the presence of a flame. The same sensor may be used to check for both the presence of the main flame and the presence of the pilot flame. The sensor is provided on a mounting device of some kind which is mounted on the burner housing. The mounting device is necessarily detachably mounted on the burner housing to allow for any necessary maintenance or repair of the sensor, but it is important that the flame monitoring device is not able to operate effectively when removed from the burner housing, for example, by placing it in front of some other flame. If it were, then a person repairing the burner might seek to do that in order to allow continued operation of the burner without the flame monitor being properly installed and that could allow gas to be fed to the burner when it was not lit, which could be very dangerous.

[0003] It is known to provide a mechanical micro-switch to detect whether or not the mounting device carrying the sensor is mounted on the burner housing. Such micro-switch arrangements have not, however, proved entirely satisfactory. Their presence is immediately obvious to a service engineer and it is usually a simple matter to bypass the switch by holding it closed with a suitable tool when it should be open, indicating the removal of the sensor.

[0004] An object of the invention is to provide a burner installation with an improved arrangement for detecting the presence of a flame monitoring device.

[0005] According to the invention there is provided a burner installation including:

a burner housing;
a burner mounted in the burner housing;
a burner flame monitoring device for detecting the presence of a flame in the burner, the monitoring device being able to provide a signal indicating the presence of the flame in the burner, the monitoring device being detachably mounted on the burner housing;
a magnet and sensor for detecting the proximity of the magnet, one of the magnet and sensor being secured in fixed relationship to the monitoring device and the other of the magnet and sensor being secured in fixed relationship to the burner housing, whereby the sensor is able to detect if the monitoring device is detached from the burner housing.

[0006] Using a magnet and sensor to detect if the mounting device is detached from the burner housing provides a system that need not be obvious to a service engineer and that is not easily bypassed. Also the system may be more reliable than a micro-switch that can be affected by particles of dirt and the like that may be present in the environment of a burner installation.

[0007] The burner flame monitoring device is preferably secured to a mounting device that is in turn detachably mounted on the burner housing.

[0008] Whilst it is in principle possible for the magnet to be mounted on the monitoring device and the sensor on the burner housing it is preferred that the magnet is secured in fixed relationship to the burner housing and the sensor is secured in fixed relationship to the monitoring device.

[0009] The magnet may be in any desired form, including for example an electromagnet, but preferably it is a permanent magnet.

[0010] The magnet is preferably generally ring shaped. The magnet is preferably provided on a cylindrical part of the burner housing, the sensor being received within the cylindrical part when the monitoring device is mounted on the burner housing. The cylindrical part of the burner housing need not be an integral part of the whole housing and in an embodiment of the invention described below it is a part separate from the rest of the housing but secured to the rest of the housing. The magnet is preferably provided on the interior of the cylindrical part. In an embodiment of the invention described below, the magnet is seated in a recess around one end of the interior of the cylindrical part. In the case where the magnet is ring shaped, the interior diameter of that ring is preferably the same as the interior diameter of a neighbouring portion of the cylindrical part. The cylindrical part may be made of steel.

[0011] Preferably the sensor is positioned inside a tubular part that is received within the cylindrical part of the burner housing. The tubular part may be part of the mounting device. It is possible for the tubular part to provide the whole of the mounting device but more commonly it represents only a portion of the mounting device. In an embodiment of the invention described below, the mounting device comprises the tubular part and a further tubular part of larger diameter coaxial with the tubular part. Preferably the sensor is positioned eccentrically within the tubular part. Such eccentric positioning facilitates the close positioning of the sensor and the magnet when the flame monitoring device is installed in the burner housing.

[0012] Preferably the tubular part is made of a material of low magnetic permeability. That is desirable if the tubular wall of the tubular part is interposed between the sensor and the magnet, as in an embodiment of the invention described below.

[0013] The tubular part may be made of aluminium or an aluminium alloy.

[0014] The sensor may take any of various forms suitable for detecting the proximity of a magnet. Preferably the sensor comprises a magnetic reed switch.

[0015] The sensor is preferably arranged to prevent

an output signal from the flame monitoring device in the event that the proximity of the magnet is not detected. That provides a very simple way of incorporating the sensor and magnet arrangement into the flame monitoring device. The sensor may, for example, disable the flame monitoring device, for example, by disconnecting a power supply to the device.

[0016] The sensor may be mounted on a printed circuit board on which the flame monitoring device is also mounted. In the embodiment of the invention described below where the mounting device includes a tubular part and a further tubular part of larger diameter, the printed circuit board may be received in the further tubular part with the sensor mounted on the printed circuit board projecting therefrom into the tubular part (that is the tubular part of smaller diameter).

[0017] The burner flame monitoring device may be of any suitable kind, including for example an ultra-violet device, but is preferably an infrared monitoring device.

[0018] The invention also provides a burner installation further including a control unit for controlling the flow of fuel and air to the burner, the control unit being arranged to prevent a flow of fuel to the burner in the event that the proximity of the magnet is not detected by the sensor.

[0019] By way of example an embodiment of the invention will now be described with reference to the accompanying drawings, of which:

Fig. 1 is a sectional side view of a portion of a burner installation;

Fig. 2 is a sectional side view of a cylindrical part of the portion of the burner installation shown in Fig. 1;

Fig. 3 is a sectional side view of a burner flame monitoring device and a mounting device therefor, forming part of the portion of the burner installation shown in Fig. 1; and

Fig. 4 is a schematic circuit diagram of parts of the burner installation.

[0020] Referring firstly to Fig. 1, a burner installation shown therein includes a burner housing that includes a wall 1, part of which is shown in Fig. 1, and a cylindrical part 2 screw threadedly connected to a spigot 3 that is welded to the wall 1. The cylindrical part 2 has an end portion 4 whose exterior is knurled to facilitate its attachment to, and detachment from, the spigot 3. The cylindrical part 2 and the spigot 3 are made of steel.

[0021] A mounting device for a flame monitor includes a tubular member 5 having a relatively small diameter front tubular part 6 which is received within the cylindrical part 2, a short intermediate part 7 which is of an intermediate diameter and is immediately outside the cylindrical part 2, a relatively large diameter rear tubular part 8 extending from the intermediate part, and an end plate 9 that is screwed over the open end of the tubular part 8 by screws (not shown) in screw holes 11. A circumferential recess 10 extends around the exterior of the front tubular part 6 and receives an O ring (not shown) sealing the interface between the cylindrical part 2 and the tubular member 5. The tubular member 5 is made of aluminium.

[0022] A printed circuit board 12 of generally circular shape is mounted across the interior of the tubular part 8 at the front thereof and secured in position by screws 13. An infrared flame sensor 14 is mounted centrally on the front face of the printed circuit board and is therefore able to detect a flame in the region generally designated 15 from a burner head indicated by dotted lines 18 in Fig. 1, since there is a line of sight from the sensor 14 through the open interior of the tubular member 5, the cylindrical part 2 and the spigot 3.

[0023] The rear tubular part 8 is provided on its circumference with a cable outlet opening 16 through which a cable can be introduced and connected to the printed circuit board 12 whilst maintaining a seal where the cable passes through the opening. The cable can provide power to the elements on the printed circuit board and convey an output signal to a control unit for the burner.

[0024] The cylindrical part 2 is generally of constant internal diameter but is recessed at its rear end where it receives a magnet 22 which, after installation in the cylindrical part is machined to the same interior diameter as the rest of the cylindrical part 2.

[0025] A magnetic reed switch 17 is mounted on the front face of the printed circuit board away from the central axis of the board and the cylindrical and tubular parts 2, 5. The position of the switch is shown in dotted outline in Fig. 1 and it can be seen that it extends alongside the interior cylindrical face of the tubular part 6 of the tubular member 5 and alongside the magnet from which it is separated by the aluminium tubular part 6. The magnetic field generated by the magnet maintains the reed switch closed.

[0026] Figs. 2 and 3 show the cylindrical part 2 and the tubular member 5 respectively. The tubular member 5 is shown without any of its ancillary parts.

[0027] Fig. 4 shows how the reed switch 17 is connected electrically with the flame monitoring device. As shown in Fig. 4 an external power supply 21 for internal power regulators 19 for the flame sensor 14 is connected via the reed switch 17. Thus, when the reed switch is in the magnetic field of the magnet (in the position shown in Fig. 1), the reed switch is held closed and power supplied to the flame sensor control circuitry as usual. If, however, the reed switch is removed from the magnetic field of the magnet then the switch opens and the flame sensor is cut off from its power supply and is therefore unable to indicate the presence of a flame.

[0028] Fig. 4 also shows that the flame sensor 14 is connected to a control unit 20 that controls the operation of the burner and in particular the flow of fuel and air to the burner. In normal operation, when the sensor 14 detects a flame, it sends an output signal to the control unit 20 and the control unit regulates the flow of fuel and air in the normal way. On the other hand, when the sensor does not detect a flame, it sends no output signal to the

control unit 20 and the control unit is programmed in that case to prevent the flow of any fuel to the burner. Similarly, even if there is a flame, if the magnetic reed switch 17 opens as a result of moving away from the magnet, there is again no signal from the sensor to the control unit 20, whether or not a flame is detected by the sensor 14, and flow of fuel to the burner is again prevented.

[0029] If it is desired to service any part of the flame monitoring device, then an engineer can simply pull the tubular member 5 out of the cylinder part 2. In doing so, of course the reed switch 17 is moved away from the magnet 22 so that there is no possibility of a signal indicative of a flame being sent to the control unit 20. The cylinder part 2 is tightly secured to the spigot 3 making detachment of the cylindrical part 2 much more difficult and, if desired, the cylindrical part 2 may be permanently secured to the spigot 3 to prevent its detachment therefrom.

[0030] In the embodiment of the invention described above the flame sensor and the reed switch are mounted on a printed circuit board which in turn is secured to a tubular member 5. It should be understood, however, that this is only one possible physical arrangement and many other arrangements are possible, provided that removal of the flame sensor from its proper location causes the reed switch to open.

Claims

1. A burner installation including:

a burner housing;
a burner mounted in the burner housing;
a burner flame monitoring device for detecting the presence of a flame in the burner, the monitoring device being able to provide a signal indicating the presence of the flame in the burner, the monitoring device being detachably mounted on the burner housing;
a magnet and sensor for detecting the proximity of the magnet, one of the magnet and sensor being secured in fixed relationship to the monitoring device and the other of the magnet and sensor being secured in fixed relationship to the burner housing, whereby the sensor is able to detect if the monitoring device is detached from the burner housing.

2. A burner installation according to claim 1, further including a mounting device to which the burner flame monitoring device is secured, the mounting device being detachably mounted on the burner housing.

3. A burner installation according to claim 1 or 2, in which the magnet is secured in fixed relationship to the burner housing and the sensor is secured in fixed relationship to the monitoring device.

4. A burner installation according to claim 3, in which the magnet is generally ring shaped.

5. A burner installation according to claim 3 or 4, in which the magnet is provided on a cylindrical part of the burner housing, the sensor being received within the cylindrical part when the monitoring device is mounted on the burner housing.

6. A burner installation according to claim 5, in which the magnet is provided on the interior of the cylindrical part.

7. A burner installation according to claim 5 or 6, in which the cylindrical part is made of steel.

8. A burner installation according to any of claims 5 to 7, in which the sensor is positioned inside a tubular part that is received within the cylindrical part of the burner housing.

9. A burner installation according to claim 8, in which the sensor is positioned eccentrically within the tubular part of the mounting device.

10. A burner installation according to claim 8 or 9, in which the tubular part is made of a material of low magnetic permeability.

11. A burner installation according to any of claims 8 to 10, in which the tubular part is made of aluminium or an aluminium alloy.

12. A burner installation according to any preceding claim, in which the sensor is arranged to prevent an output signal from the flame monitoring device in the event that the proximity of the magnet is not detected.

13. A burner installation according to any preceding claim, in which the sensor is mounted on a printed circuit board on which the flame sensor is also mounted.

14. A burner installation according to any preceding claim, in which the burner flame monitoring device is an infrared monitoring device.

15. A burner installation according to any preceding claim, further including a control unit for controlling the flow of fuel and air to the burner, the control unit being arranged to prevent a flow of fuel to the burner in the event that the proximity of the magnet is not detected by the sensor.

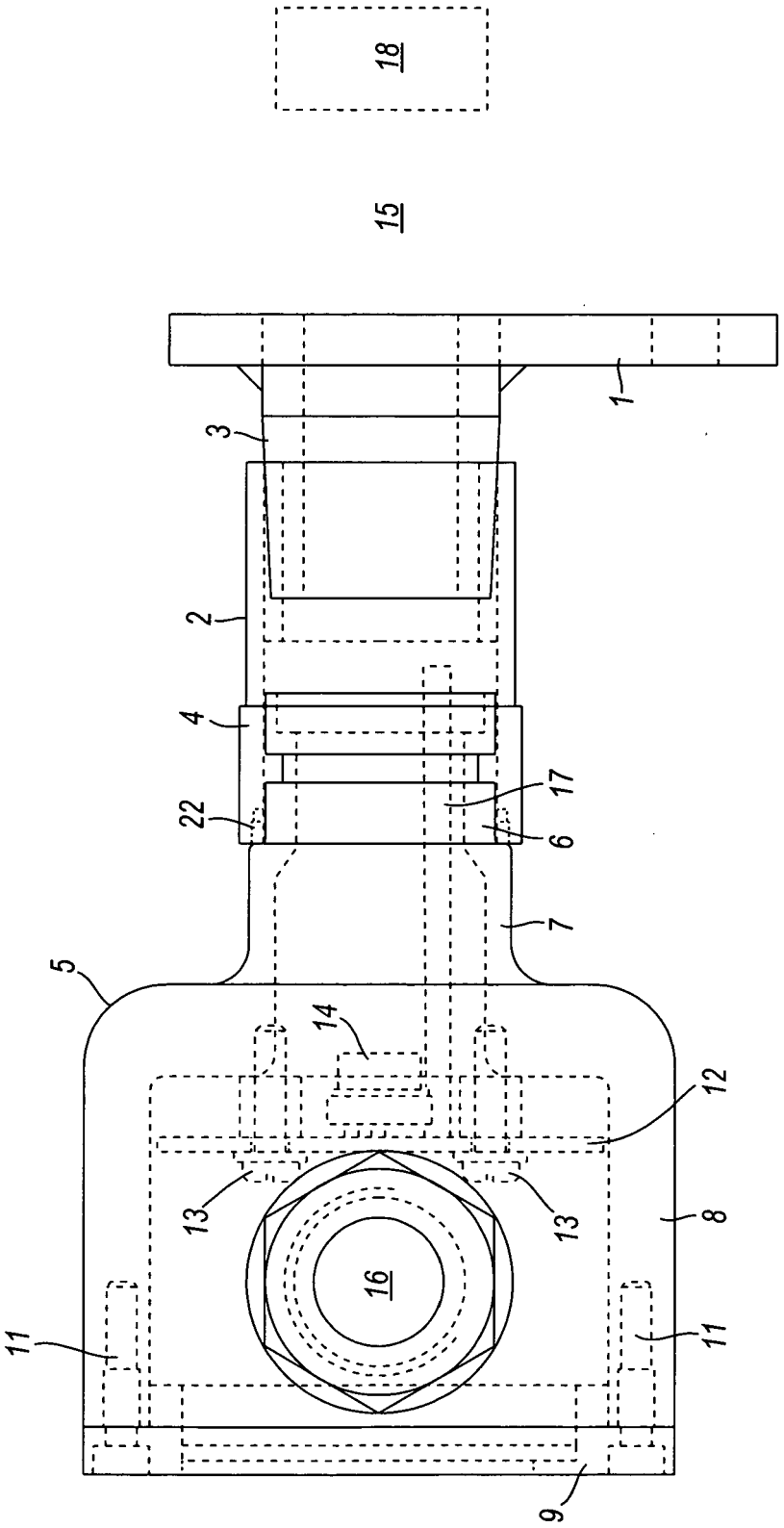

Fig.1

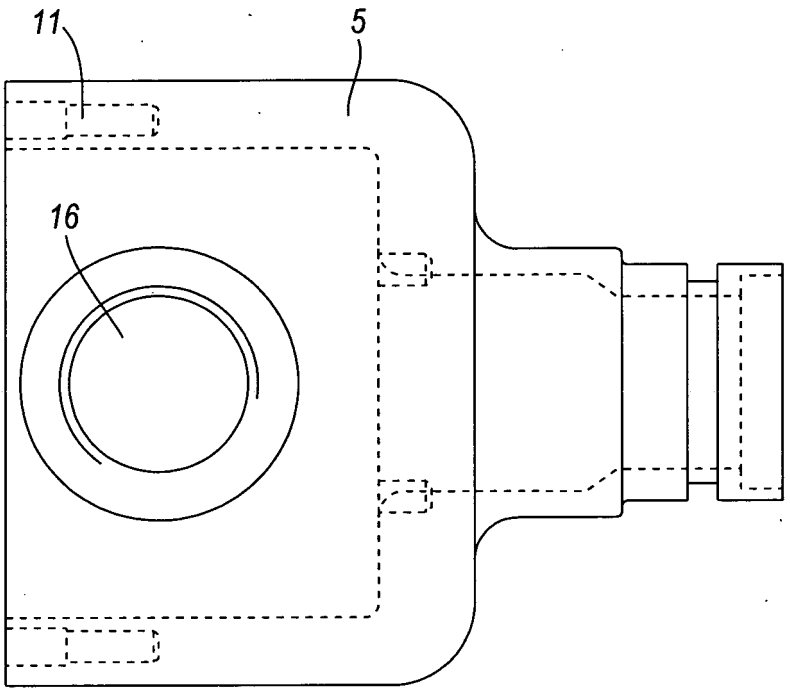

Fig.2

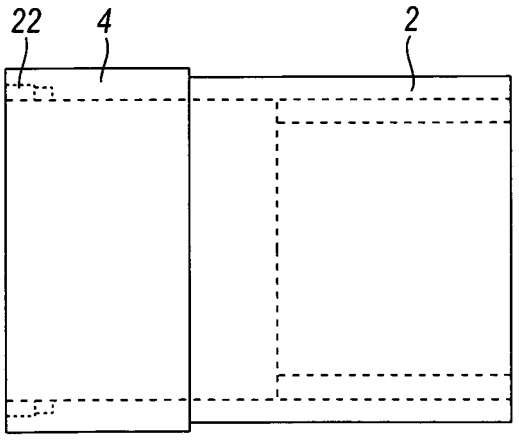

Fig.3

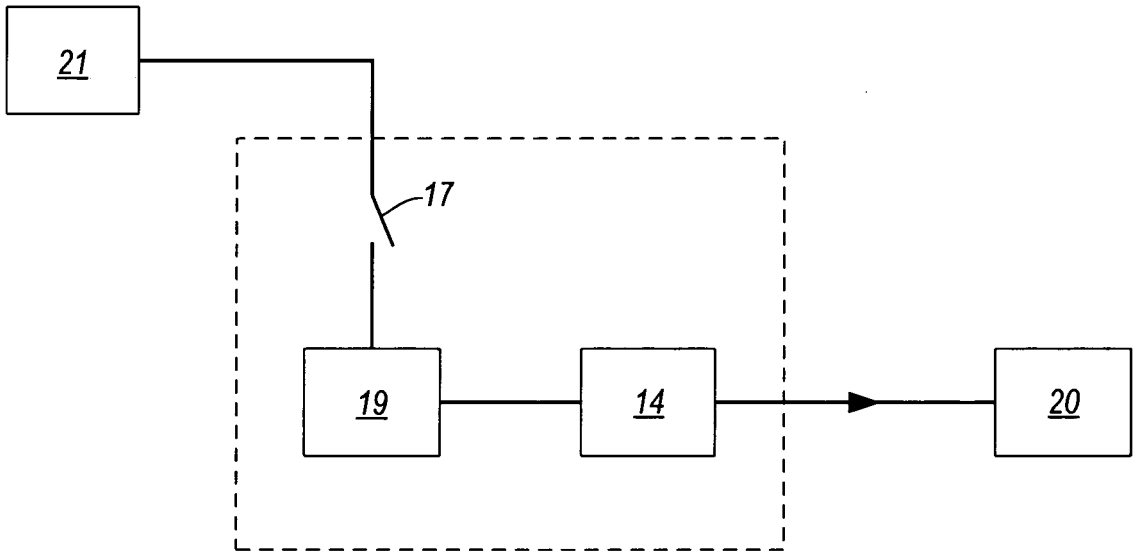

Fig.4