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(71) Applicant: **AEA S.r.l.**
60030 ANGELI DI ROSORA AN (IT)

(72) Inventors:
- **Carletti, Marco**
  Jesi (Ancona) 60035 (IT)
- **Ilari, Moreno**
  Sassoferrato (Ancona) 60041 (IT)
- **Romiti, Gino**
  Filottrano (Ancona) 60024 (IT)

(74) Representative: **Faggioni, Carlo Maria Fumero**
Studio Consulenza Brevetti Snc
Pettenkoferstrasse 20-22
80336 Munich (DE)

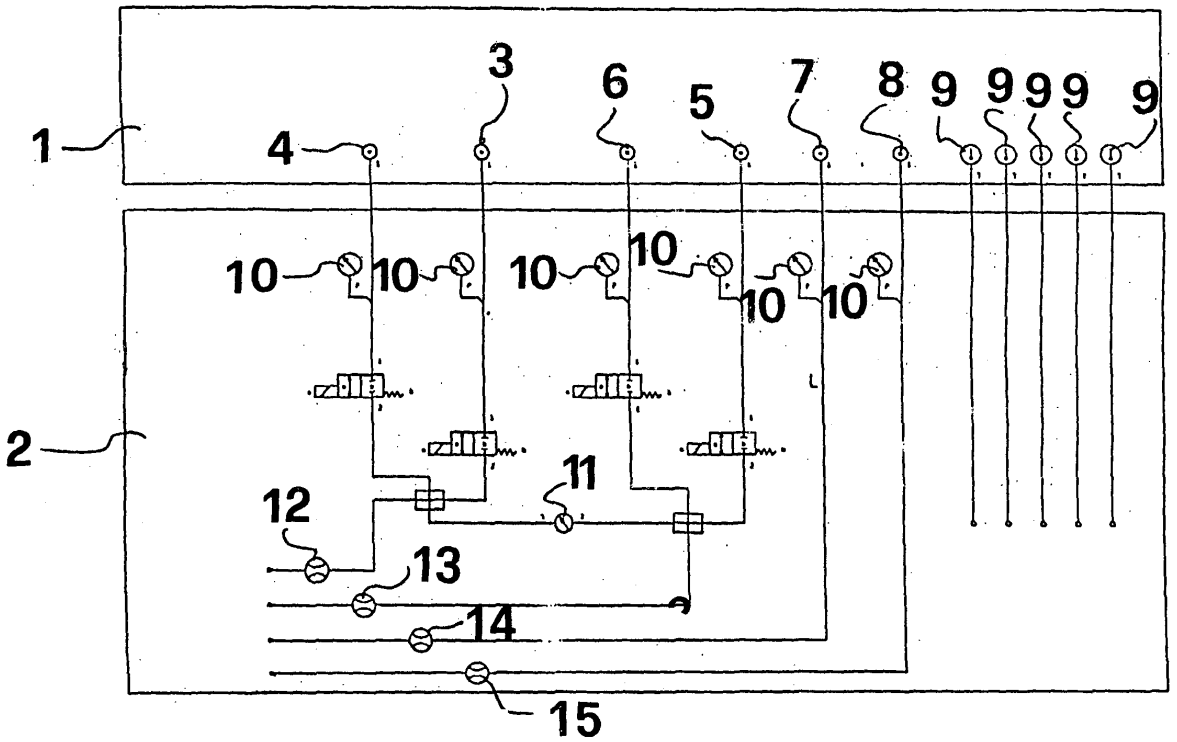
(54) General test and inspection process for boilers

(57) A method for boiler testing, to check the various operation parameters thereof, which is run employing gaseous substances, such as air, nitrogen, helium, argon, or a mixture thereof is described.

In the implementation of the method, a step checking the electric resistance of the circulation pump windings of the boiler can also be provided.

A device for testing a boiler is also disclosed, comprising a pressure gauge (10), a differential pressure gauge (11), and a series of flow meters (12-15).

The method and the device are preferably used to test wall-mounted boilers.



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Description

[0001] The present invention refers to a new method to carry out a general test and inspection process on boilers, particularly on wall-mounted gas-fired boilers.

[0002] Given the intensive use of standard wall-mounted, gas-fired boilers, be they used for sanitary water, for heating, or for both, and given the danger of any gas leaks or, although to a lesser degree, of water leaks, before selling said boilers to the public it is necessary to proceed to a test of each of them immediately after production. For such purpose, boilers are normally bench-tested, trying to reproduce as closely as possible the habitual operation conditions of their working life.

[0003] Therefore, gas and pipes are connected to the boiler, as well as the power supply, gas supply, flue chimney, outer thermostats, temperature sensors, in-series connections and any other connections. After connecting, the boiler is fired up and water temperatures and gas consumption are checked. A visual check of water leaks and of flame quality is also carried out.

[0004] However, this test has a series of far from negligible problems. Firstly, such tests are normally carried out in a warehouse and require an extremely complex flue suction system, due to the combustion time required to obtain appreciable water heating. Following the test, it is necessary to fully remove the water found in the boiler. Even minimal residual traces of water may lead to damage due to rusting processes of the boilers and to deterioration of the packaging while they are stocked; being normally card-controlled boilers, the risk is of irreversible damaging such electronic cards, which are negatively affected by humidity. Moreover, before disposal, the water of the test must be cooled for disposal.

[0005] Also, consumption of the water this test entails is no longer a negligible cost.

[0006] The drawbacks detailed above are brilliantly solved by the present invention, which concerns a method for testing boilers, for checking the various operation parameters thereof, characterised in that it is performed by using gaseous substances.

[0007] The present invention also concerns a device, suitable to boiler testing with the method according to the present invention.

[0008] The present invention will now be described in greater detail, with reference to the only drawing, which consists of an operation diagram of an embodiment of a device according to the present invention.

[0009] The diagram shown in the figure shows a unit 1, referring to the boiler under test and a unit 2, referring to the testing bench according to the present invention.

[0010] Boiler 1 comprises a supply 3 and a return 4, relative to heating, an inlet 5 and an outlet 6, relative to sanitary water, a fuel supply 7 and a pressure gauge 8 of the boiler gases. 9 shows a series of temperature gauges.

[0011] As far as the testing bench is concerned, each pipe from and to the boiler comprises a pressure gauge 10. Pipes 4 and 5 are connected to a differential pressure gauge 11. There is a series of flow meters 12-15 connected to pipes 3, 6, 7 and 8, respectively.

[0012] According to the present invention, during the test, no liquids are supplied to boiler 1. Firstly, boiler 1 is put under pressure by supplying a non-combustible gas, for example air, nitrogen, helium, argon, or a mixture thereof and, through pressure gauges 10, the seals of the circuits are assessed. If leaks exceed a certain threshold, the pipe under examination is considered faulty and the piece is repaired or replaced.

[0013] Thereafter, gas is supplied to pipes 4 and 5 and the differential pressure is assessed by gauge 11, in order to check if there are detectable pressure drops. In this case, too, the comparison against threshold values allows to establish piece compliance.

[0014] The subsequent step is a check of the electric resistance of the circulation pump windings. Testing of the pump is completed by a manual operation in order to visually check the operation thereof.

[0015] In order to verify pump rotation in undersupply conditions (for example 198 Vac), the water manostat is excluded and the pump power voltage is manually adjusted through a rheostat or through a Variac; supply is then provided to the pump and the differential change of the pressure between inlet and outlet is checked, comparing it against compliance values.

[0016] In order to check burner and safety manostat start up, combustible gas is supplied through pipe 7, air is sent cold to the heat exchanger, and the burner is supplied manually. The subsequent step is to measure the gas flow rate through meter 14, while flame quality is assessed visually, in a manner known per se. If the situation so far is in order, the operator pushes a button which informs bench 2 that the check evidenced no problems. At this point, a blow of counterpressurised gaseous substances is sent to the safety manostat, thereby checking also pipe 8, the air blow interrupting fuel supply in 7.

[0017] A preferred procedure according to the present invention can be outlined as follows:

a) boiler 1 is put under pressure;
b) pressure drops are measured;
c) air is supplied to heating return and sanitary water inlet pipes 4, 5;
d) the differential pressure is measured;
e) the electric resistance of the circulation pump winding is checked;
f) the pump is operated manually and operation thereof is checked visually;
g) the water manostat is excluded;
h) the pump supply voltage is adjusted;
i) change in the pump pressure differential is checked;
j) combustible gas is supplied to the boiler and air is sent cold to the heat exchanger;
k) the burner is supplied manually;
l) the gas flow rate to the burner is measured;

m) flame quality is assessed visually;
n) a positive check button is pushed; and
o) counterpressurised gaseous substances are sent to the manostat and flame failure is checked.

[0018] As can be easily understood, the present invention allows to do completely without water, to minimise gas consumption (since starting up for testing is limited to a few seconds), no (costly and bulky) heat exchangers are required for test water cooling, there are no down times due to emptying, there are no liquids in the boiler upon packaging, in particular water or other corrosive fluids, it is not necessary to previously introduce anti-freeze and/or anti-oxidant liquid before stocking the boiler, and there is not the problem of sucking the flues, since the quantities involved are minimal.

[0019] Moreover, greater precision and rapidity of leak tests and a more precise measurement of pressure drops is obtained.

Claims

1. Method for testing boilers, to check the various operation parameters thereof, **characterised in that** it is performed by using gaseous substances.

2. Method as claimed in claim 1), **characterised in that** the boiler (1) to be checked is provisionally put under pressure, by supplying a gas.

3. Method as claimed in claim 2), **characterised in that** said gaseous substances are chosen from the group consisting of air, nitrogen, helium, argon, or of a mixture thereof.

4. Method as claimed in any one of the preceding claims, **characterised in that**, any pressure drops are assessed by means of pressure gauges (10).

5. Method as claimed in any one of the preceding claims, **characterised in that** gaseous substances are supplied to heating water and inlet hot sanitary water return pipes (4 and 5) and the differential pressure is checked by means of a differential meter (11), in order to check if there are pressure drops exceeding a threshold value.

6. Method as claimed in any one of the preceding claims, **characterised in that** it comprises a check step of the electric resistance of the windings of the boiler circulation pump.

7. Method as claimed in any one of the preceding claims, **characterised in that** testing of the circulation pump comprises a manual operation step, in order to visually check the operation thereof.

8. Method as claimed in any one of the preceding claims, **characterised in that** it includes a step in which the water manostat is excluded and the pump supply voltage is automatically adjusted by means of a rheostat or of a Variac, **in that** the pump is then supplied with fuel, and **in that** the differential change of the pressure between inlet and outlet is checked.

9. Method as claimed in any one of the preceding claims, **characterised in that** it is provided to start up the burner and the safety manostat, to supply combustible gas through pipe (7), to send air cold to the heat exchanger, and to manually supply the burner in order to subsequently measure gas flow rate by means of a meter (14), while flame quality is assessed visually.

10. Method as claimed in any one of the preceding claims, **characterised in that**, after an operator pushes a button instructing the apparatus that the check evidenced no problems, a blow of counterpressurised gaseous substances is sent to the safety manostat and also pipe (8) is thereby checked, thereby interrupting fuel supply in (7).

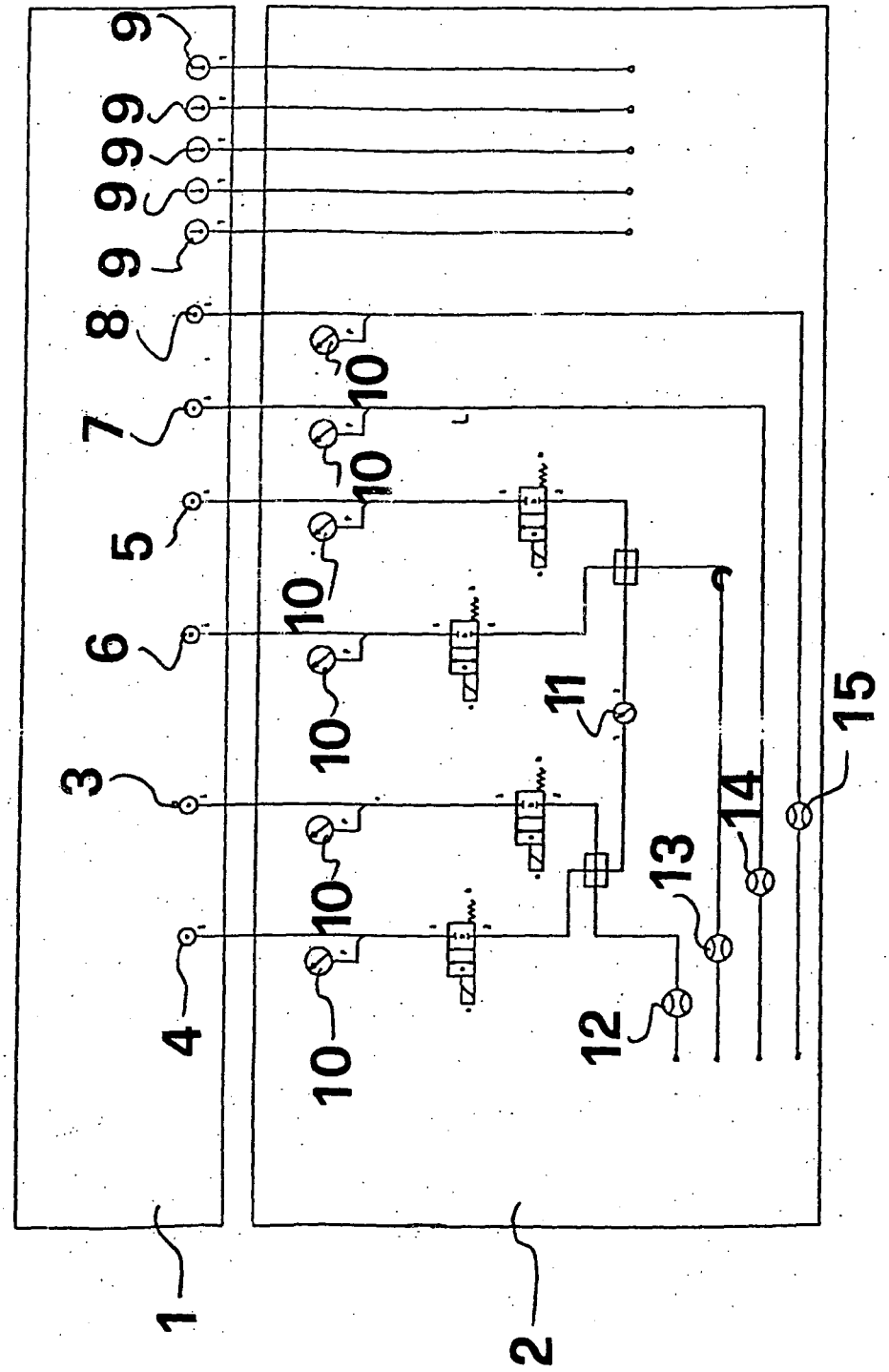
11. Method as claimed in any one of the preceding claims, **characterised in that** it comprises the following steps:

    a) boiler (1) is put under pressure;
    b) pressure drops are measured;
    c) gaseous substances are supplied to heating return and sanitary water inlet pipes (4, 5);
    d) the differential pressure is measured;
    e) the electric resistance of the circulation pump windings is checked;
    f) the pump is operated manually and operation thereof is checked visually;
    g) the water manostat is excluded;
    h) the pump supply voltage is adjusted;
    i) the differential pump pressure change is checked;
    j) combustion gas is supplied and air is sent cold to the heat exchanger
    k) the burner is supplied manually;
    l) the gas flow rate to the burner is measured;
    m) the flame quality is assessed visually;
    n) a positive check button is pushed; and
    o) counterpressurised gaseous substances are sent to the manostat and flame failure is checked.

12. Device for boiler testing, **characterised in that** it comprises a pressure gauge (10), a differential pressure gauge (11) and a series of flow meters (12-15).

13. Use of a method as claimed in any one of claims 1) to 11) and of a device as claimed in 12), for the testing

of wall-mounted boilers.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