United States Patent

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[54] **LIGHT DETECTOR WITH CLEANING AND TESTING MEANS**
6 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **250/232,** 250/218, 356/207, 431/79
[51] **Int. Cl.** **G01d 5/36**
[50] **Field of Search** 250/216, 218, 232; 431/79; 356/207

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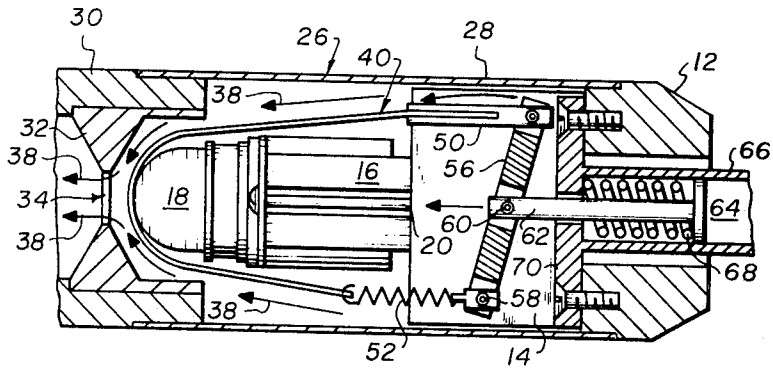
ABSTRACT: A furnace flame detector having a light-sensitive tube which can be periodically wiped clean and blocked off from the flame light to be tested. A web has a wiper section in contact with the tube and is connected with an actuating mechanism for periodically moving the wiper section over the tube. The wiper section has a centrally located aperture which permits the flame light to impinge on the sensing tube, so that when the wiper section is moved over the tube, it is cleaned and the flame light is intermittently blocked off to permit the tube to be tested.



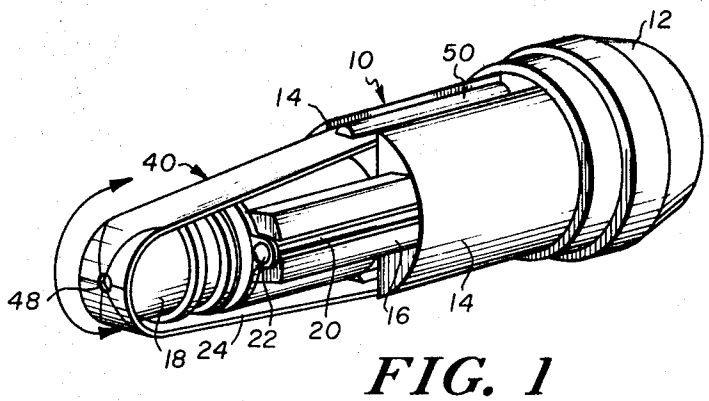


FIG. 1

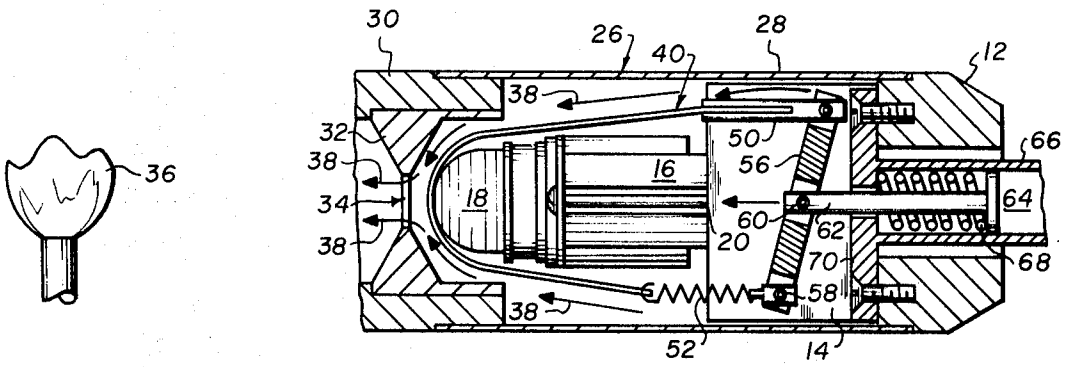


FIG. 2

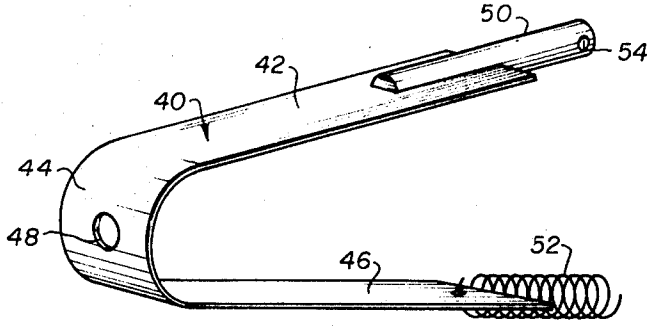


FIG. 3

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LIGHT DETECTOR WITH CLEANING AND TESTING MEANS

BACKGROUND OF THE INVENTION

In a modern steam generator, the loss of flame at a burner decreases efficiency and lowers the energy output. In addition, a boiler tube may be damaged because it will not receive enough heat to vaporize the water in it. In passing to the vapor stage, the water cools the tube much more than it would by merely passing through the tube without changing to steam, as it does when deprived of heat.

To guard against such mishaps, sensing elements are provided in the steam generator to detect a loss of flame at the burners. The sensing elements are sensitive to the flame light and are each positioned so that the light from a flame impinges against it. If a burner should lose its flame, a sensing element will either transmit a signal or discontinue signal transmission to shut down the generator or indicate to an operator that the boiler should be shut down until the defective burner is repaired.

One problem which has been encountered is that the high temperatures in the portion of the steam generator adjacent to the burners may eventually make the sensing elements too insensitive to detect a loss of flame. In order to solve this problem, flame detectors have been cooled by providing a stream of cooling air in the manner described and claimed in U.S. Pat. Ser. No. 719,768, which was filed on Apr. 7, 1968 in the name of William J. Moore, now Pat. No. 3,437,807 and assigned to Foster Wheeler Corporation and which issued on Apr. 8, 1969 as U.S. Pat. No. 3,437,807. Still another problem is created by the soot and other matter present in the burner area, which will tend to coat the sensing element so that it will not be able to correctly detect a loss of flame.

SUMMARY OF THE INVENTION

It is an object of the present invention to overcome the problems found in the prior art such as those discussed above. Accordingly, a light-sensitive tube is engaged by a belt having a wiper section. The belt is provided with an aperture at the wiper section and an actuating mechanism, to move the section back and forth over the tube to clean it and move the aperture to intermittently block off the flame light to permit the tube to be tested.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a portion of a light detector assembly made in accordance with the present invention;

FIG. 2 is a view partly in section in a scale larger than that of FIG. 1 of the present assembly; and

FIG. 3 is a detailed view of the wiper web and its associated spring used in the assembly of FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The assembly shown in FIG. 1 and designated as **10** includes a base **12** and solid body portions **14** extending forwardly therefrom. Extending forwardly from the body portions **14** are arms **16** which are parallel to the longitudinal axis of the device. Although only one arm **16** can be seen in FIG. 1, another extends parallel to it along the obscured side of the device. A light-sensitive element or tube **18** is mounted at the free ends of arms **16** by means of screws **20**, each of which extends through an ear **22**, integral with flange **24** of the tube **18**.

The assembly is positioned in a housing **26** (FIG. 2) which includes a generally cylindrical cover **28** extending outwardly from the base **12** to an annular collar **30** at its opposite end. The annular collar **30** encircles an annular ring **32** which defines an orifice **34** which permits light from the flame **36** to communicate with the tube **18**.

In order to assure that the tube **18** will not be heated to such a high temperature that it is insensitive to the presence of the light from the flame **36**, cooling air moving in the direction of the arrows **38** is forced through the housing **26** and out the orifice **34** to cool the tube **18**.

It has been explained that in the past, the accumulation of soot and other matter on the tube **18** has prevented it from functioning correctly. It has also been explained that in order to ascertain that the tube **18** is functioning properly, it is blocked off from the flame light from time to time to be sure that it will sense and signal the absence of light. Both of these functions are carried out in the present invention by means which include a flexible web **40** (FIG. 3) having a straight portion **42**, a wiper section **44** and a straight portion **46**. The more or less straight portions **42** and **46** merge with, and extend rearwardly from the wiper section **44**. An orifice **48** located centrally in the wiper section **44** permits the light to pass from the flame **36** to the tube **18**. When the web **40** is operated to test and clean the tube **18**, the portions **42** and **46** are each reciprocated so that the portion **42** moves forward while the portion **46** moves to the rear and vice versa. This action moves the wiper section **44** and its associated orifice **48** back and forth over the tube **18** so that light from the flame **36** is intermittently blocked off from the tube **18**. The tube's sensitivity to the light can be tested during this times, because it will if it is functioning properly, signal alternately the presence and absence of flame light. Movement of the wiper section **44** over the tube **18** will also wipe it clean of soot or other matter which have an adverse effect upon its sensitivity. The matter which is removed from the tube **18** will be blown out of the orifice **34** by the cooling air moving in the direction of the arrows **38**.

The web **40** is oscillated by means of linkage which includes an elongated member **50** at the rear end of the straight portion **42** and a coil spring **52** secured to the rear end of the straight portion **46**. The rear end of the member **50** includes a hole **54** at which the member **50** is pivoted to a link **56**. The link **56** extends generally in a vertical plane, its upper end being pivoted to the member **50** and its lower end being pivoted at a point **58** which is fixed with respect to the body portions **14** of the device **10**. The rearward end of the coil spring **52** is also fixed with respect to the body portion **14**. The link **56** is pivoted at a point pivot **60** between its ends with a piston rod **62** which extends rearwardly to a piston **64** which is slideably positioned within a cylinder **66**. The piston **64** is urged rearwardly by a coil spring **68** which extends in the cylinder **66** around the piston rod **62** and between the piston **64** and a forward wall **70** of the cylinder **66**. When compressed air is intermittently supplied to the rear surface of the piston **64**, it will reciprocate against the spring **66** to oscillate the link **56** about the pivot point **58** through the piston rod **60**. This in turn will reciprocate the member **50** which will push and pull the section **42** to move the wiper section **44** back and forth over the tube **18**. The straight portion **46** will reciprocate with the wiping section **44** but will be held taut by the spring **52** to assure that the wiper section **44** is held in contact with the tube **18**.

It will be appreciated that the foregoing describes but one preferred embodiment of the present invention and that other embodiments are possible without exceeding its scope.

We claim:

1. A light-detecting apparatus having a light-detecting element which may be tested and cleaned periodically comprising a flexible web having a wiping section engaging said element, said section having an aperture which permits light to pass through said web and impinge upon said element, and means to move said web in relation to said element so that a portion of it always engages against said element so that light is alternately blocked and allowed to pass through said aperture to permit said element to be tested while said web removes soot or other matter from said element.

2. The apparatus defined in claim 1 wherein, said means engages said web at one of its ends.

3. The apparatus defined in claim 2 wherein, the other end of said web is engaged by a spring which permits said web to oscillate under the action of said means while urging said wiping section against said element.

4. The apparatus defined in claim 2 wherein, said web has ends which extend rearwardly of said element.

5. The apparatus defined in claim 4 wherein, said means comprises a piston connected with said one end, said piston being slideable to reciprocate said one end.

6. The apparatus defined in claim 4 wherein, the other end

of said web is connected with a spring which permits said web to oscillate while urging said wiping section against said element.