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(54) **BURNER CONTROL INSTRUMENT AND METHOD**

BRENNERREGELGERÄT UND VERFAHREN

INSTRUMENT ET PROCEDE SERVANT A COMMANDER UN BRULEUR

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(73) Proprietor: **Autoflame Engineering Limited**
Franthorne Way Bellingham
London SE6 3BX (GB)

(72) Inventor: **KEMP, Brendan**
Kent TN13 2QP (GB)

(74) Representative: **Bardo, Julian Eason et al**
Abel & Imray
20 Red Lion Street
London WC1R 4PQ (GB)

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- **PATENT ABSTRACTS OF JAPAN vol. 010, no. 044 (M-455), 21 February 1986 & JP 60 196522 A (MATSUSHITA DENKI SANGYO KK), 5 October 1985,**
- **PATENT ABSTRACTS OF JAPAN vol. 095, no. 006, 31 July 1995 & JP 07 075180 A (SHARP CORP), 17 March 1995,**

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Description

[0001] The invention relates to a burner control instrument including a display apparatus. The invention also relates to a method of controlling a burner.

[0002] GB 2,138,610 describes a burner control system in which the settings of fuel and air valves, which control the amounts of fuel and air supplied to a burner head, are controlled by the burner control system. When the control system is first installed it is commissioned by a skilled engineer who is able to select appropriate pairs of fuel valve and air valve settings to achieve optimum combustion at a variety of levels of output of the burner. Both during commissioning and during running it is desirable for the control system to be able to display certain information to an operator. In the system described in GB 2,138,610 a basic form of display is provided which relies on light emitting diodes. Such a display has a long life but the amount of information that can be conveyed in such a display is limited.

[0003] Liquid crystal displays are very commonly employed in a wide variety of technologies. For a small liquid crystal display, backlighting for the display may be provided by a light emitting diode but for larger displays the backlighting would typically be provided by cold cathode fluorescent tubes or electro-illuminant devices; such displays may be of almost any selected size enabling large amounts of information to be displayed, if desired. However, the devices employed to provide the backlighting have a limited lifetime; many such displays are commercially available at present but they have a limited lifetime which typically might be 8,000 hours.

[0004] A continuous period of 8,000 hours is rather less than a year, which is an unacceptably short lifetime for burner control instruments. One known way of extending the lifetime of the display is to arrange for it to turn itself off after a predetermined period of inactivity. The technique is not, however, ideal for a display of a burner control instrument. One role of such a display is to show current values of variables relating to the operation of the burner so that a person can see at a glance the current situation. In such a case it is unsatisfactory for the person to have to switch on the display to activate it but it is also unsatisfactory for the display to be switched on permanently, because it is then likely to need replacing within about a year.

[0005] JP-A-60-196522 describes a liquid crystal display for a cooking apparatus in which, in order to prolong the life of backlighting of the display, two kinds of backlighting are provided. One form of backlighting is used during a non-cooking period and only during the cooking period is the other form of backlighting employed.

[0006] US-A-5,457,664 describes a timepiece with indicator hands for the analog display of the time and an electro-luminescent element for lighting up the hands when required. The timepiece also has a sensor for detecting when a person is in the room where the time-

piece is situated. When no person is detected by the sensor, the indicator hands are stopped and the electro-luminescent element extinguished in order to conserve energy and reduce noise. When a person is detected by the sensor, the indicator hands are driven until they show the correct time and, if it is dark, the electro-luminescent element is also activated.

[0007] It is an object of the invention to provide a burner control instrument including a display apparatus, which is convenient to use but which is able to be switched off during periods of non-use.

[0008] According to the invention there is provided a burner control instrument for controlling at least some functions of a burner, the instrument including:

a display,
switch means for switching the display on and off, and
a sensor for detecting proximity of a person to the display, the sensor being arranged to cause the switch means to switch the display on in response to detecting the proximity of a person.

[0009] When a burner control system is running, there is generally no need for an operator to intervene, but there may well be data that he wishes to see on a display. By using a proximity detector to detect that a person is approaching the display, it becomes a simple matter to arrange for the display to be switched on immediately before there is a possibility that a person might wish to read it. When no person is sufficiently close to the display to read it, the proximity detector remains inactivated and the display remains switched off, thereby extending the life of the display.

[0010] Preferably, timing means are provided, the timing means being arranged to cause the switch means to switch the display off after a period of time. Preferably the display is switched off after a predetermined period of time has elapsed since any detection of a person by the proximity sensor. With such an arrangement the display should remain switched on throughout any time period when a person might wish to see it.

[0011] The invention may be applied to any display apparatus where there is a benefit in switching off the display when it is not being used, but the invention is especially applicable to liquid crystal displays which have a limited life, typically because they are backlit by light sources of a limited life. The backlighting may comprise one or more cold cathode fluorescent tubes or one or more electro-illuminant devices. Such displays generally have a lifetime in continuous use of less than 15,000 hours and a period of 8,000 hours without noticeable degradation of quality is a typical current industry standard. If by applying the present invention to a display apparatus it is possible to reduce the period per day for which the display is switched on to, say, 2 hours, then a display that would have a life of 8,000 hours continuous use may have its life extended from less than

one year to more than eight years.

[0012] The sensor for detecting proximity of a person to the display may be one whose output is affected simply by the distance of an object from it or it may be one that detects movement of an object. Any sensor that is able to fulfil the function of detecting a person's arrival is to be regarded as a proximity sensor. Infra red sensors are currently made in very large volumes for security applications and are therefore available at low cost, which makes them especially suitable. Other possible sensors include those relying on ultrasonics, the Doppler effect or changes of capacitance.

[0013] The present invention still further provides a 5 method of controlling a burner comprising the following steps:

controlling the flow of fuel and air to the boiler,
monitoring certain variables relating to the combustion process in the burner,
providing a display for displaying information relating to the combustion process, and
switching the display on in response to detecting proximity of a person to the display.

[0014] The method of the invention may be carried out employing any of the forms of display apparatus described above. Thus the method may for example further include the step of switching the display off in response to a predetermined period of time passing without detection of proximity of a person.

[0015] 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 perspective view of a burner control unit,
Fig. 2A is a sectional side view of the control unit
Fig. 2B is an enlarged sectional side view of part of the control unit shown in Fig. 2A,
Fig. 3 is a diagram showing the detection range of a sensor in the control unit,
Fig. 4 is a block diagram showing the operational relationship of certain components of the control unit, and
Fig. 5 is a block diagram of a boiler installation including the burner control unit of Fig. 1.

[0016] Fig. 1 shows a burner control unit 1 for a fuel burner of a boiler. Control units of this general kind are well known and are commercially available; for example there are the Micro Modulation Control Systems of Autoflame Engineering Limited. GB 2,138,610 B and GB 2,169,726 B are concerned with inventions relating to such control units and the disclosures of both those patent specifications are incorporated herein by reference.

[0017] The burner control unit 1 provides output control signals to a motor for operating a fuel valve and a motor for operating an air valve to control the amounts of fuel and air flowing to the burner. The control unit 1

also receives input signals comprising for example signals from sensors which detect the positions of valve members of the air and fuel valves, one or more signals from sensors detecting variables relating to the products of combustion and a signal indicating the temperature of water in the boiler. In operation the control unit receives the temperature input signal, compares it with a desired value and according to the difference in the two values adjusts the air and fuel valves to alter the rate of combustion in the boiler. Signals relating to the products of combustion are also received by the control unit and may be used to make adjustments to the ratio of air and fuel supplied to the burner, as more fully described in GB 2,169,726 B.

[0018] In order for the burner control unit 1 to operate effectively in use with a particular burner installation it must be commissioned. In the case of the burner control unit 1 of GB 2,138,610 B such commissioning includes, amongst other steps, selecting and storing pairs of output control signals for the air and fuel valves at different levels of output of the burner so as to optimize the combustion process throughout the whole operational range of the burner. When the control unit 1 is subsequently operating it compares an input signal indicating the temperature of water in the boiler with stored data indicating a desired temperature and, according to the difference, selects a level of output for the burner. The control unit is then able to determine appropriate positions for the air and fuel valve members and to adjust the members as necessary, taking account also of input signals relating to the products of combustion and any other inputs that the control unit may receive.

[0019] During both the commissioning operation and during subsequent running of the boiler, it is desirable for an operator to be able to read data from the control unit 1 and for this purpose the control unit 1 is provided with a display 2 on its front face 3. The particular information presented on the display is not a part of the present invention and will not be described in detail here. Examples of information that may be displayed are: the actual and desired temperature in the boiler; the current level of operation of the burner; currently desired and actual settings of the fuel and air valves; the amount of oxygen (or other gases) in the combustion products. It will be appreciated that various other information can also be displayed as well as or instead of that just referred to.

[0020] The display 2 is a liquid crystal display which in this particular example is 10cm high and 7.5cm wide. The display is backlit by cold cathode fluorescent tubes which are liable to begin to degrade after about 8,000 hours of use. In the particular example described, the display is an LM 32010P liquid crystal display manufactured by Sharp Corporation of Osaka, Japan.

[0021] In order to extend the life of the display 2 an arrangement is provided for automatically switching the display on and off as will now be described further.

[0022] The control unit 1 is mounted with its front face

3 approximately vertical and, as shown in Figs. 1, 2A and 2B, has a window 4 in its front face behind which an infra red sensing arrangement is provided mounted on a printed circuit board 5. The control unit 1 has a front face plate 6 which is provided with an opening defining the window 4. The window 4 is covered by a piece of polyethylene sheet material 7 that is substantially transparent to infra red radiation. Mounted on the printed circuit board 5 is a pyroelectric infra red sensor 8 and interposed between the sensor 8 and the sheet material 7 is a fresnel lens 9. As shown in Fig. 3 the arrangement of the sensor 8 and the fresnel lens 9 is such that the sensor 8 is sensitive to infra red radiation arriving at the window 4 in any direction inclined at an angle of more than about 45° to the plate 6. The sensitivity of the sensor 8 is such that it will detect a person moving anywhere within this field at a range of up to about 3 metres. of course that range can readily be selected to a different value of, say, between 0.1 and 12m, by changing the lens 9.

[0023] Referring now also to Fig. 4 of the accompanying drawings, the backlighting of the display 2 is powered from a power supply 10, with an electronic switch 11 controlling the connection of the power to the display. Operation of the switch is controlled by a switch control circuit 12 including a microprocessor 12A and software timer logic 12B. The circuit 12 receives inputs from the infra red sensor 8 via an amplifier 13 and an analogue to digital converter 14.

[0024] In use, the display 2 is normally disconnected from the power supply 10. If, however, the sensor 8 detects a person approaching the control unit 1, the switch control circuit 12 receives an input indicative of that from the sensor 8 and, in response, operates the switch 11 to connect the power supply 10 to the backlighting of the display 2. The person is then able to read the display without having to take any positive action to switch on the display. Detection of a person also causes activation of the software timer logic 12B. After a predetermined time (for example, 15 minutes) the timer logic 12B causes the switch control circuit 12 to open the switch 11, thereby disconnecting the power supply 10 from the backlighting of the display 2. For a final portion of that period (for example the last two of the fifteen minutes), the control circuit 12 again looks for a signal from the sensor 8 and, in the event that the sensor detects movement of a person within its range it will supply a signal indicative of that to the control circuit 12 which, in response, will reset the timer.

Thus the switch 11 will be opened only after a continuous period, of the length of the predetermined period, has elapsed if the sensor 8 has not detected any movement during the final part of that period.

[0025] of course it may be that a person will pass in the vicinity of the sensor 8 without having any desire to read the display 2 and in such a case the display 2 will be activated unnecessarily. Such wasteful powering up of the display is unlikely, however, to be a very frequent

occurrence and therefore the life of the display 2 will be extended very significantly. At the same time, from a user's viewpoint the operation of the display will be the same as if it were continuously backlit.

5 [0026] The use of an infra red sensor and associated control circuitry simply to enable the backlighting of the display to be switched off when not needed might seem an excessively complicated and expensive enhancement of a boiler control unit. In fact, however, such sensors are not unduly expensive, suitable control circuitry can easily be designed and the use of such an arrangement makes it much more practical to incorporate a liquid crystal display in a burner control unit. Without the switch-off facility the expected lifetime of the display would be only about one year which is too short a period for a burner control unit.

[0027] Fig. 5 shows a particular example of how the burner control unit of Fig. 1 may be employed in a boiler installation. The boiler installation shown in Fig. 5 comprises a boiler 20 including a burner head 21, a combustion chamber 22 and a flue 23. Air is fed to the burner head 21 from an air inlet 24, via an inlet damper 25 through a centrifugal fan 26 and, finally, an outlet damper 27. The burner head 21 is able to operate with either gas or oil as the fuel; gas is fed to the burner head from an inlet 28 via a valve 29 whilst oil is fed to the burner head from an inlet 30 via a valve 31. The boiler has a water outlet pipe 32 with a manually-operated valve 33 and a water return pipe 34 with a conventional manually-operated valve 35 and an additional valve 36.

[0028] The control unit 1 is connected to various sensing devices as shown in the drawing. More particularly the unit is connected via an exhaust gas analyser 37 to an exhaust gas analysis probe 38, to a load sensor (temperature sensing device) 39 monitoring the water outlet of the boiler, and to a flame detection unit 40 at the burner head. The control unit 1 is also connected via an inverter interface unit 41 and an inverter 42 to the motor of the fan 26 (with interface unit 41 receiving a feed back signal from a tachometer 26A associated with the fan 26), via a first air servo motor 43 to the air inlet damper 25, via a second air servo motor 44 to the air outlet damper 27, to an air pressure sensing device 45 provided in the air supply duct downstream of the outlet damper 27, via fuel servo motors 46 to the fuel valves 29, 31, to a further servo motor 47 for adjusting the configuration of the burner head 21, and to a control unit 36A for the valve 36 on the water return pipe 34 to the boiler. Thus the control unit 1, including a proximity sensor 8, performs all the control functions for the burner unit, including the functions that would conventionally be carried out by a separate control box (for example the control of the burner during the ignition phase).

[0029] Whilst the invention has been described above with reference to a particular form of burner control unit, it should be understood that the invention can be applied to any of a wide variety of burner control units performing all or only some of the burner controlling functions. Also

whilst the unit is referred to as a burner control unit, it should be understood that the unit may have other functions not related to the burner, for example, ones related to a boiler, and indeed those functions may even be the main functions of the control unit.

[0030] In the described embodiment of the invention, it is only the power to the backlighting of the display that is switched off; it will be appreciated of course that it is a simple matter, if desired, to arrange for the infra red sensor also to switch off any other elements of the control unit in response to detecting proximity of a person. Also, whilst the display described above is a liquid crystal display, the invention may be applied to other forms of display.

Claims

1. A burner control instrument for controlling at least some functions of a burner, the instrument including:

a display (2),
switch means (11) for switching the display (2) on and off, and
a sensor (8) for detecting proximity of a person to the display (2), the sensor (8) being arranged to cause the switch means (11) to switch the display (2) on in response to detecting the proximity of a person.

2. A burner control instrument according to claim 1, further including timing means (12B) arranged to cause the switch means (11) to switch the display (2) off after a period of time.

3. A burner control instrument according to claim 1, in which the display (2) is a liquid crystal display including backlighting.

4. A burner control instrument according to any preceding claim, in which the backlighting comprises one or more cold cathode fluorescent tubes.

5. A burner control instrument according to any one of claims 1 to 3, in which the backlighting comprises one or more electro-illuminant devices.

6. A burner control instrument according to any preceding claim, in which the display (2) has a lifetime in continuous use of less than 15,000 hours.

7. A burner control instrument according to any preceding claim, in which the sensor (8) is an infra red sensor.

8. A method of controlling a burner comprising the following steps:

controlling the flow of fuel and air to the boiler, monitoring certain variables relating to the combustion process in the burner, providing a display (2) for displaying information relating to the combustion process, and switching the display (2) on in response to detecting proximity of a person to the display.

10 Patentansprüche

1. Brenner-Steuerungsinstrument zum Steuern wenigstens einiger Funktionen eines Brenners, wobei das Instrument umfaßt:

eine Anzeige (2),
Schaltmittel (11) zum Ein- und Ausschalten der Anzeige (2) und
einen Sensor (8), der die Nähe einer Person bei der Anzeige (2) erfaßt und so beschaffen ist, daß er die Schaltmittel (11) dazu veranlaßt, die Anzeige (2) als Antwort auf die Erfassung der Nähe einer Person einzuschalten.

2. Brenner-Steuerungsinstrument nach Anspruch 1, das ferner Zeiteinstellungsmittel (12B) enthält, die so beschaffen sind, daß sie die Schaltmittel (11) dazu veranlassen, die Anzeige nach einer Zeitperiode auszuschalten.

3. Brenner-Steuerungselement nach Anspruch 1, bei dem die Anzeige (2) eine Flüssigkristallanzeige ist, die eine Hintergrundbeleuchtung umfaßt.

4. Brenner-Steuerungsinstrument nach einem vorhergehenden Anspruch, bei dem die Hintergrundbeleuchtung eine oder mehrere Kaltkathoden-Fluoreszenzröhren umfaßt.

5. Brenner-Steuerungsinstrument nach einem der Ansprüche 1 bis 3, bei dem die Hintergrundbeleuchtung eine oder mehrere Elektrolumineszenzvorrichtungen umfaßt.

6. Brenner-Steuerungsinstrument nach einem vorhergehenden Anspruch, bei dem die Anzeige (2) eine Lebensdauer bei ununterbrochenem Gebrauch von weniger als 15000 Stunden hat.

7. Brenner-Steuerungsinstrument nach einem vorhergehenden Anspruch, bei dem der Sensor (8) ein Infrarotsensor ist.

8. Verfahren zum Steuern eines Brenners, das die folgenden Schritte umfaßt:

Steuern der Kraftstoff- und der Luftströmung zum Boiler,

Überwachen bestimmter Variablen, die mit dem Verbrennungsprozeß im Brenner in Beziehung stehen,
 Vorsehen einer Anzeige (2) zum Anzeigen von Informationen, die mit dem Verbrennungsprozeß in Beziehung stehen, und
 Einschalten der Anzeige (2) als Antwort auf die Erfassung der Nähe einer Person bei der Anzeige.

les étapes suivantes :

commander le flux d'un combustible et d'air vers le brûleur,
 surveiller certaines variables relatives au processus de combustion dans le brûleur,
 se procurer un afficheur (2) pour visualiser des informations relatives au processus de combustion, et
 mettre en marche l'afficheur (2) en réponse à la détection de la proximité d'une personne de l'afficheur.

Revendications

1. Instrument de comande d'un brûleur pour commander au moins quelques fonctions du brûleur, l'instrument comprenant :
 un afficheur (2) ,
 des moyens de commutation (11) pour commuter l'afficheur (2) en marche et arrêt, et
 un capteur (8) pour détecter la proximité d'une personne à l'afficheur (2), le capteur (8) étant agencé pour provoquer la mise en marche de l'afficheur (2) par les moyens de commutation (11) en réponse à la détection de la proximité d'une personne.
2. Instrument de commande d'un brûleur selon la revendication 1, comprenant en outre des moyens temporisateurs (12B) agencés pour provoquer l'arrêt de l'afficheur (2) par les moyens de commutation (11) après une certaine durée.
3. Instrument de commande d'un brûleur selon la revendication 1, dans lequel l'afficheur (2) est un afficheur à cristaux liquides comprenant un éclairage de fond.
4. Instrument de commande d'un brûleur selon l'une quelconque des revendications précédentes, dans lequel l'éclairage de fond comprend un ou plusieurs tubes fluorescents à cathode froide.
5. Instrument de commande d'un brûleur selon l'une quelconque des revendications 1 à 3, dans lequel l'éclairage de fond comprend un ou plusieurs dispositifs électroluminescents .
6. Instrument de commande d'un brûleur selon l'une quelconque des revendications précédentes, dans lequel l'afficheur (2) a une durée de vie de moins de 15 000 heures en fonctionnement continu.
7. Instrument de commande d'un brûleur selon l'une quelconque des revendications précédentes, dans lequel le capteur (8) est un capteur infrarouge.
8. Procédé de commande d'un brûleur, comprenant







