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Description

[0001] The present invention relates to an oil supply safety device for the delivery of oil to an oil fired boiler.

[0002] Surprisingly, one of the major causes of failure of an oil fired boiler during operation is the failure of the oil supply pump(s). This is usually caused by water being mixed with the fuel oil. For example, it is suggested that 25% of the failures is the result of this. Strangely enough, this problem has become more of a problem in recent years because of the prevalence of plastics storage tanks, rather than what was very prevalent in previous years, namely, steel tanks. The latter were usually fitted with drain off valves, namely, gate valves with removable plugs which maintenance personnel used on a regular basis to drain off water and sediment. Generally, such valves are not fitted to plastics tanks. Further, as well as not having such a service point, these tanks are moulded in such a way as to provide legs and other supports, all of which provide pockets for the storage of sediment and water.

[0003] There are certain other problems which have been rectified in the past to a greater or lesser degree. Briefly, these are entrained air in the fuel oil and the overheating of the area surrounding the boiler due to some malfunction. The former is relatively easily rectified. The latter, indeed, is the subject of fire regulations, in many jurisdictions, which require the fitting, on installation, of a remote fire sensing valve. One such construction comprises a long capillary tube connected to a small bowl or bulb holding a combustible liquid such as petrol. This fire valve is fitted externally with the capillary tube running alongside the lines and the bulb fitted adjacent the burner. If there is a fire in the boiler house, the combustible liquid goes on fire and the valve cuts off the oil supply. Obviously, it is vital to prevent a fire as much as possible. The problem with this device is that it only operates when there is a fire in the boiler house itself and does not take account of the fire occurring in, for example, a room adjacent to the boiler.

[0004] What is required is to provide a safety device which will overcome this problem of water mixed with the fuel oil and to provide a control device, means or system, which will control some or all of the problems listed above.

Statements of Invention

[0005] According to the invention, there is provided an oil supply safety device for the delivery of oil to an oil fired boiler for fitting between an oil supply tank and the oil fired burner, the device comprising:

a buffer tank having an inlet for oil from the oil supply tank and an outlet for delivery of oil to the boiler;

a water sensing device to detect the level of water in the buffer tank; and

control means to cause the electrical supply to be cut-off and hence the oil supply to or from the buffer tank to be shut off and the burner stopped, on the water reaching a predetermined critical height in the buffer tank.

[0006] By preventing the water level in the buffer tank rising above this critical depth or height, water is not drawn out of the buffer tank and hence the problems of a suspension of oil in water being delivered to the pumps and other equipment is prevented.

[0007] In another embodiment of the invention, the control means provides a warning of the level of the water reaching a height somewhat less than the critical height in the buffer tank. Ideally, the householder wishes to have a warning on the onset of a problem before the system is shut down. This allows the householder to take corrective action.

[0008] In these devices, optionally, the control means for causing the oil supply to the buffer tank to be shut off comprises a pair of spaced-apart electrodes operatively connected to an electrical circuit forming part of the control means whereby, on water rising to immerse both of the electrodes, the electrical circuit is made and the electrical supply is shut off. Using electrodes is particularly advantageous, as they are relatively inexpensive and almost foolproof.

[0009] In another embodiment of the invention, there is a third electrode higher in the buffer tank than one of the other two electrodes and connected to another electrical circuit whereby, on water rising to immerse the two electrodes, a warning of imminent shutdown is given and, on reaching the third electrode, the electrical supply is shut off.

[0010] In another embodiment of the invention, the buffer tank comprises a pair of chambers, namely, an oil inlet chamber and an oil outlet chamber and an oil filter interspersed between the chambers, whereby the oil is filtered on being delivered from the inlet chamber to the outlet chamber for subsequent delivery to the oil fired burner.

[0011] In a further embodiment of the invention, a de-aerator is mounted in the buffer tank.

[0012] In another embodiment of the invention, a temperature sensing device is mounted remote from the boiler and operatively connected to the control means whereby on the temperature rising above a predetermined level, the electrical supply is shut off, thus closing the oil supply off and shutting down the oil fired burner.

[0013] In another embodiment of the invention, on the temperature rising above the predetermined level, additional fire alerting devices are activated.

[0014] In a further embodiment of the invention, there is provided a waste water tank connected via a pump to an inlet adjacent the bottom of the buffer tank whereby, on the water level reaching a predetermined depth in the buffer tank, the pump is activated to remove a preset quantity of water from the buffer tank.

Detailed Description of the Invention

[0015] The invention will be more clearly understood by the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic view of a safety device and associated control system according to the invention; and

Fig. 2 is a diagrammatic view, similar to Fig. 1, of an alternative embodiment of the invention.

[0016] Referring to the drawings and initially to Fig. 1 thereof, there is illustrated an oil supply safety device, hereinafter a safety device, indicated generally by the reference numeral 1 and associated control means, namely a control box 2, and associated electrodes, as described below. Strictly speaking, the control means forms part of the overall safety device 1. The control box 2 connects power supply lines 8 to an oil-fired burner, not shown, and is in turn fed by lines 9 from a main supply, not shown.

[0017] There is provided a buffer tank 3 divided into two chambers, namely, an inlet chamber 4 and an outlet chamber 5, connected together by a feed pipe 6 between the inlet chamber 4 and the outlet chamber 5, which is fed directly by an oil filter, in this embodiment, a 15 μ filter and identified by the reference numeral 7. The buffer tank 3 has a bottom, identified by the reference numeral 19. A drain-off pipe 25 and associated hand-operated valve 26 are mounted in the bottom 19.

[0018] An oil supply pipe 10 feeds from an oil supply tank, not shown, through a standard valve 11. The oil supply pipe 10 delivers oil from the oil supply tank to the inlet chamber 4 of the buffer tank 3.

[0019] Mounted in the outlet chamber 5 is a water sensing device, identified generally by the reference numeral 18, comprising a pair of electrodes, namely, a positive electrode 15 and a negative electrode 16 connected to the control box 2. The electrodes 15 and 16 are spaced apart a distance from the bottom 19 of the buffer tank 3. The distance chosen is one which, when the depth of water reaches that height in the buffer tank 3, a warning should be given to the householder of the need to carry out maintenance by removing the water from the buffer tank 3.

[0020] The electrodes 15 and 16 are connected to a suitable electrical circuit and audible and visual warning devices. It will be appreciated that when the electrodes 15 and 16 are no longer immersed in oil, but in a liquid, namely, water, which is conductive, a circuit will be made between them and then depending on the control circuit, necessary operations may take place which, in this case, as mentioned above, is simply the delivery of a warning to the householder. These are conventional and do not need to be described or illustrated as they are well known

to most industries.

[0021] An oil burner supply pipe 12 feeds, via a motorised valve 13 from the outlet chamber 5, an oil burner mounted in an oil fired boiler, neither of which are shown. The motorised valve 13 could, for example, be a normally open solenoid valve.

[0022] A further electrode 17 which can, it would be appreciated, be either positive or negative is mounted in the buffer tank 3 above the electrodes 15 and 16. The height of the electrode 17 above the bottom 19 is chosen as a critical depth for water in the buffer tank 3. Again, as before, when the depth of water rises to reach the electrode 17, the electrical circuit to which it is connected is made. In this case, it is a critical depth and a signal is sent from the control box 2 to cut off the electrical supply. This disconnection of the electrical supply causes the motorised valve 13 to shut down and the oil burner to stop operating.

[0023] There is also illustrated a pair of air vents 20 and 21, connected to the outlet chamber 5 and the inlet chamber 4, respectively. These are conventional and require no explanation.

[0024] Additionally, a temperature sensing device 22, provided by a thermostat or thermistor, is mounted in the boiler house or externally thereof and again is not shown, which is in turn connected to the control board 2, whereby, on the thermostat 22 reaching a critical temperature, the electrical supply is cut off. There can be more than one thermostat 22 or indeed thermistors around the dwelling in which the boiler is situated. In addition to cutting off the electricity, there will also be provided suitable fire alert messages, both audible and visual. This will require the use of additional fire alerting devices.

[0025] The great advantage of this remotely fitted thermostat 22 is that once there is a fire anywhere within a dwelling house, the power supply is cut off with the consequent cutting off of the oil supply and the burner operation. This is considerably more advantageous than the present arrangement.

[0026] The drain-off pipe 25 facilitates the removal of water during maintenance or indeed may be used, in certain circumstances, when the warning is given of the water having reached the two electrodes 15 and 16. In this way, the water never reaches the critical depth causing the electrical supply to be cut off due to the presence of water in the buffer tank 3.

[0027] Referring to Fig. 2, there is illustrated an alternative construction of safety device, indicated generally by the reference numeral 28. Parts similar to those described with reference to the previous drawings are identified by the same reference numerals. In this embodiment, the electrode 17 has been removed. It will be appreciated that equally, one of the electrodes 15 and 16 could have been omitted. There is provided a waste water tank 30 fed by a waste water pipe 31 and a pump 32 from a bottom of the outlet chamber 5 of the buffer tank 3.

[0028] In use, when the level of water reaches the electrodes 15 and 16, instead of an audible or visual warning,

the pump 32 is activated and a preset quantity of water is delivered out of the outlet chamber 5 into the waste water tank 30. The capacity of the waste water tank 30 may be chosen so that, under normal usage, it may only require to be emptied during planned maintenance. The construction of the waste water tank 30 may be so chosen as to comply with all disposal regulations.

[0029] It will be appreciated that instead of operating the pump 32 for a preset time with the electrodes 15 and 16, it could be used to determine not only when the pump 32 was to be started, but also when it could be shut off.

[0030] It will be readily appreciated by those skilled in the art that there are many other ways of sensing, for example, when the water reaches a predetermined depth in the buffer tank and the necessary corrective action may be taken, whether it be, the switching off of the electrical supply and the shutdown of the plant, the furnishing of a warning or indeed the institution of an automatic bleed-off of that water.

[0031] It will be appreciated that there are many ways in which the water in the buffer tank may be disposed of, such as, for example, the use of some form of bleed-off valve connected to a much larger container, whereby, on the volume of water in the buffer tank exceeding a predetermined amount and hence an excess weight, the water would trickle out the buffer tank into a separate removable water storage tank. It could also just be a simple additional tank mounted below the buffer tank and connected thereto by a pipe and associated valve.

[0032] In this specification, the terms "comprise", "comprises", "comprised" and "comprising" and the terms "include", "includes", "included" and "including" are deemed totally interchangeable and should be afforded the widest possible interpretation.

[0033] The invention is in no way limited to the embodiment hereinbefore described but may be varied in both construction and detail within the scope of the claims.

Claims

1. An oil supply safety device (1,28) for the delivery of oil to an oil fired boiler for fitting between an oil supply tank and the oil fired burner, the device (1) comprising:

a buffer tank (3) having an inlet (10) for oil from the oil supply tank and an outlet (12) for delivery of oil to the boiler;

a water sensing device (18) to detect the level of water in the buffer tank (3); and

control means (2,15,16) to cause the electrical supply to be cut-off and hence the oil supply to or from the buffer tank (3) to be shut off and the burner stopped, on the water reaching a predetermined critical height in the buffer tank (3).

2. A safety device (1) as claimed in claim 1, in which,

additionally, the control means (2,15,16) provides a warning of the level of the water reaching a height somewhat less than the critical height in the buffer tank (3).

3. A safety device (1) as claimed in claims 1 and 2, in which the control means for causing the oil supply to the buffer tank to be shut off comprises a pair of spaced-apart electrodes (15, 16) operatively connected to an electrical circuit forming part of the control means whereby, on water rising to immerse both of the electrodes (15, 16), the electrical circuit is made and the electrical supply is shut off.

4. A safety device (1) as claimed in claims 1 and 2, in which there is a third electrode (17) higher in the buffer tank (3) than one of the other two electrodes (15, 16) and connected to another electrical circuit whereby, on water rising to immerse the two electrodes (15, 16), a warning of imminent shutdown is given and, on reaching the third electrode (17), the electrical supply is shut off.

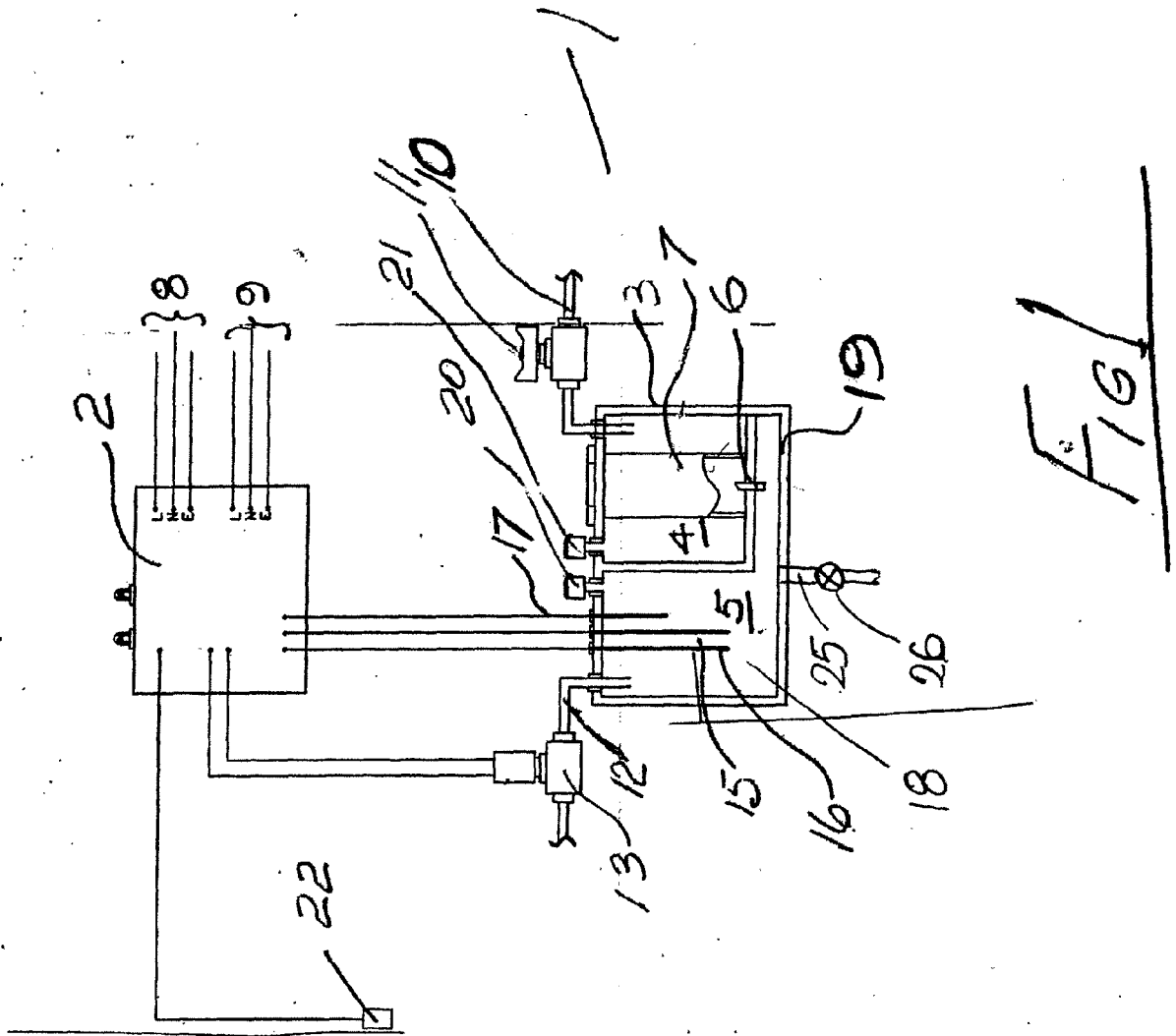
5. A safety device (1) as claimed in any preceding claim, in which the buffer tank (3) comprises a pair of chambers, namely, an oil inlet chamber (4) and an oil outlet chamber (5) and an oil filter (7) interspersed between the chambers (4,5), whereby the oil is filtered on being delivered from the inlet chamber (4) to the outlet chamber (5) for subsequent delivery to the oil fired burner.

6. A safety device (1) as claimed in any preceding claim, in which a de-aerator (20, 21) is mounted in the buffer tank (3).

7. A safety device (1) as claimed in any preceding claim, in which a temperature sensing device (22) is mounted remote from the boiler and operatively connected to the control means (2) whereby on the temperature rising above a predetermined level, the electrical supply is shut off, thus closing the oil supply off and shutting down the oil fired burner.

8. A safety device (1) as claimed in claim 7, in which, on the temperature rising above the predetermined level, additional fire alerting devices are activated.

9. A safety device (1) as claimed in any preceding claim, in which there is provided a waste water tank (30) connected via a pump (32) to an inlet adjacent the bottom (19) of the buffer tank (3) whereby, on the water level reaching a predetermined depth in the buffer tank (3), the pump (32) is activated to remove a preset quantity of water from the buffer tank (3).



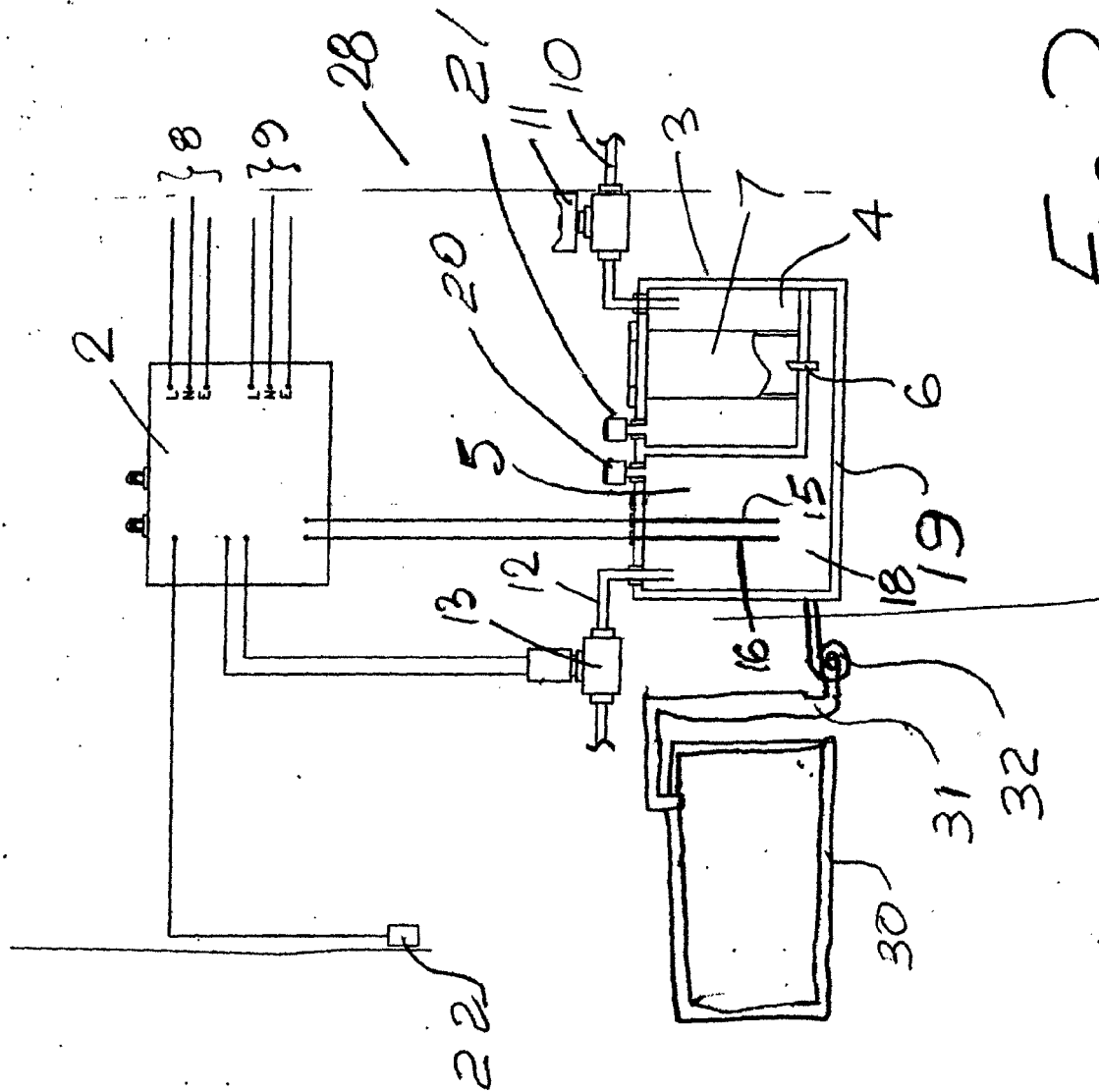


Fig 2



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 6534

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 378 353 A (KOCH BERTHOLD [DE]) 3 January 1995 (1995-01-03) * page 1, line 31 - page 4, line 48; figures 1,2 *	1,6-9	INV. F23K5/08 B01D17/02
X	US 4 960 513 A (YOUNG JAMES T [US]) 2 October 1990 (1990-10-02) * page 2, line 9 - page 5, line 44; figures 1,2 *	1,6-8	
X	US 2008/150552 A1 (STRAUB ROBERT D [US]) 26 June 2008 (2008-06-26) * paragraph [0011] - paragraph [0017] *	1-4,6-8	
X	US 4 539 109 A (DAVIS LELAND L [US]) 3 September 1985 (1985-09-03) * column 2, line 36 - column 10, line 10; figures 1-7 *	1,3,5-8	
A	US 3 485 370 A (NOZAKI TOSHIO; MORI KUNIHITO; USHIROKAJITANI YOSHIYUKI; OKAMOTO KENYA) 23 December 1969 (1969-12-23) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) F23K B01D
A	US 3 345 978 A (YATES JOHN W) 10 October 1967 (1967-10-10) * the whole document *	1	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 February 2010	Examiner Theis, Gilbert
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 15 6534

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-02-2010

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