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(54) **Fire extinguishing apparatus for ducting systems.**

(57) Fire extinguishing apparatus for ducting incorporating an extractor fan, comprising a fire extinguisher arranged to discharge extinguishing medium into the duct upstream of the extractor fan at a predetermined temperature and a temperature sensing unit operatively connected to a circuit selector control for cutting-out the fan when the unit detects a preset temperature less than the operating temperature of the extinguisher and including a by-pass circuit whereby the fan can be restarted following discharge of the extinguisher. A visual and/or audible indication of the state of the selector control circuit is provided to assist manual setting of the by-pass circuit when required.

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FIRE EXTINGUISHING APPARATUS FOR DUCTING SYSTEMS

This invention relates to fire extinguishing apparatus for ducting, in particular so called grease ducts used in catering establishments and other situations where inflammable or potentially inflammable materials are extracted. These ducts constitute a hazard since if a fire starts in the ducting it can spread rapidly to other parts of the building. The problem is particularly severe in ducts leading from grills and griddles because the flames are often generated during cooking. Once the fire has started it is difficult immediately to detect and extinguish.

It has been customary to provide, at intervals along the length of the ducting, doors which are held open by fusible links. The fusible links are intended to melt at fire temperature, so allowing the doors to close but in practice deposits of grease and dirt tend to clog the mechanism and the lumen of the duct is reduced in size so rendering the doors partially or completely inoperative.

It has been proposed to mount on a length of grease ducting a fire extinguisher at least the discharge opening of which is disposed within the ducting, the extinguisher incorporating a heat sensitive release valve operable at a predetermined temperature to release the fire extinguishing medium into this duct when the temperature in the duct reaches this setting. This system has proved most effective in extinguishing fire, before it is able to take full hold or spread to other parts of the building.

In order to avoid firstly the so called "blow torch effect" created by the extractor fan and secondly the expulsion of the extinguishing medium from the duct before it has had time to be effective, it is desirable to switch off the fan as soon as possible after the onset of the fire, until the fire extinguisher has discharged and the fire is extinguished. At this stage it is important to clear the system of smoke and noxious fumes before they gradually percolate into public areas so disturbing normal working conditions.

According to this present invention we propose fire extinguishing apparatus for ducting incorporating an extractor fan and comprising a fire extinguisher having a discharge head disposed within the ducting upstream of the extraction fan and a heat sensitive valve means operable to release the fire extinguishing medium into the duct at a predetermined temperature, and a temperature sensing unit operatively connected to a circuit selector control for cutting out the

fan when the unit detects a pre-set temperature less preferably by at least 90°F, than the predetermined operating temperature of the first extinguisher and including a by-pass circuit whereby the fan can be restarted following discharge of the fire extinguisher. Preferably, the state of the selector control circuit is displayed by an indicator light or lights and optionally an audible alarm.

In the preferred embodiment, the tempature sensing unit is disposed upstream from the fire extinguisher by no more than 3 metres and, further, comprises thermal probe extending into the interior of the ducting.

Embodiments of this invention will now be described by way of example, with reference to the accompanying drawing which is a schematic view of the fire extinguishing apparatus installed in a grease duct leading from a kitchen 10 to the exterior wall 12 of a building. Near the external outlet 14, an extractor fan 16 is mounted within the ducting 18 to draw air therethrough from an inlet head 20 disposed above a cooking range 22 in the kitchen.

A fire extinguisher 24, mounted externally of the ducting in an intermediate position, preferably close to the inlet head 20, has a sprinkler discharge head 25 which extends through the duct wall into the middle of the duct and which is fitted with a deflector plate 26 designed to direct a large proportion of the extinguishing medium toward the upstream

end of the duct. In an alternative embodiment, however, the entire extinguisher may be mounted within the duct in which case the size and shape of the extinguisher casing are such as to offer minimum resistance to the flow of air through the duct.

It is preferred to use a pressurised type of extinguisher the capacity of which is determined according to the volume of ducting to be protected. The extinguishing medium may be either a liquefied halogen gas mixture (e.g. BTM or BCF - Bromine, Chlorine, Fluorine) or MONEX (Registered Trade Mark) powder, both of which are internationally recognised and approved or, indeed, any suitable fire extinguishant. BCF has the secondary advantage that it is of very low toxicity, is pure, non-corrosive, and remains effective however long it is stored. Further, it leaves little mess or trace. Monex powder is superior to other powders: it does not compact on storage and is compatible with protein foam.

Incorporated in the sprinkler head 25 is a heat sensitive valve which is operable at a desired temperature to allowing the extinguishing medium to escape, under pressure, into the duct.

Upstream of the fire extinguisher and preferably spaced from the extinguisher by no more than 3 metres, is a temperature sensing unit 30 which is mounted on the exterior

of the ducting and has a probe 31, typically 10 cm to 30 cm in length, projecting radially inwards. The unit 30 incorporates heat sensitive mechanism e.g. a bimetallic strip which distorts when heated until, at a pre-set temperature of at least 50°C less than the temperature setting of the extinguisher, an electrical switch is operated to actuate a circuit selector control 32 connected to the fan starter 35.

The circuit selector control 32 comprises a three position switch and two indicator lights; one red 33 and the other green 34.

In one position of the switch corresponding to the normal operating stage, the fan is working and the green indicator light 34 is lit. When the probe operates upon reaching the pre-set temperature, the fan is cut out. When a fire has been extinguished the switch can be passed through a neutral position to a third position in which a by-pass circuit is completed enabling the fan to be restarted.

When the by-pass circuit is enabled the red indicator light 33 is lit. When the fan cut-out switch is re-set following replacement of the discharged fire extinguisher both indicator lights 33 and 34 are lit to warn that the circuit is in the override or by-pass mode. The three position switch should then be reset manually to the said one position corresponding to the normal operating state of the apparatus.

In the event of a fire, the temperature sensing unit 30 actuates the fan cut-out switch at the lower temperature determined by the setting of the unit that is to say before (by a few seconds) the fire extinguisher is triggered by the heat sensitive valve, hence, the extraction system is inoperative during discharge of the fire extinguisher and so the ducting fills with fumes, but the fumes can be cleared after the fire has been extinguished, since the selector control circuit can be used to by-pass the fan cut-out switch and the fan may be restarted.

In a modified embodiment, the circuit selector control 32 comprises a two-position switch with an audible alarm 37 and only one indicator light 38 which is not illuminated in the normal operating state. When the probe detects the pre-determined temperature the control activates the red light, sounds the alarm and automatically stops the fan. A control circuit for the modified embodiment is shown in Figure 2 in the normal operating mode with both the light and the alarm off.

L_1, L_2 and L_3 are the mains supply to the contractor coil and A,B and C are outgoing connections to the fan motor. The mains supply L_3 is connected to L on the heat probe 31 and in the normal operating mode, L is connected to L_R which is connected to 1, which is connected to 6, which is connected to L_1 at the fan coil.

When the probe operates to cut out the fan, the current path is L_3,L,BC,3,2,5,buzzer,L_1 and from BC to the light.

so that both the buzzer and the light are on.

When the fire has been extinguished in order to restart the fan, the key switch on the control box is turned to override the cut-out mode and the current path is now L_3,L,BC,3,6, L_1 and from BC to the light, so that the buzzer is off but the light is still on.

To return to the normal operating mode, the key switch on the control box must be turned back and the heat probe button must be reset.

The apparatus of the present invention is not restricted to grease ducts. Indeed it is suitable for any duct extraction system which conveys volatile or inflammable substances such as hydro-carbons or other chemicals, sawdust, wool, cotton, paint, ink and dust.

CLAIMS

1. Fire extinguishing apparatus for ducting incorporating an extractor fan and comprising a fire extinguisher having a discharge head disposed within the ducting upstream of the extraction fan and a heat sensitive valve operable to release the fire extinguishing medium into the duct at a predetermined temperature, and a temperature sensing unit operatively connected to a circuit selector control for cutting out the fan when the unit detects a pre-set temperature less than the predetermined operating temperature of the fire extinguisher and including a by-pass circuit whereby the fan can be restarted following discharge of the fire extinguisher.

2. Apparatus according to claim 1 wherein the state of the selector control circuit is indicated visually and/or audibly.

3. Apparatus according to claim 2 wherein the selector control circuit includes an indicator lamp which lights when the fan is cut-out following detection of the said pre-set temperature.

4. Apparatus according to any one of claims 1 to 3 wherein the temperature sensing unit comprises a thermal probe extending into the interior of the ducting.

5. Apparatus according to any one of claims 1 to 4 wherein the temperature sensing unit is disposed upstream from the fire extinguisher.

6. Apparatus according to any one of claims 1 to 5 wherein a deflector plate is so disposed in relation to the discharge head as to direct the extinguishing medium toward the upstream end of the duct.

7. Apparatus according to any one of claims 1 to 6 and comprising a switch operable manually to complete the by-pass circuit after the fan has been cut-out.

8. Fire extinguishing apparatus for ducting incoporating an extractor fan, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

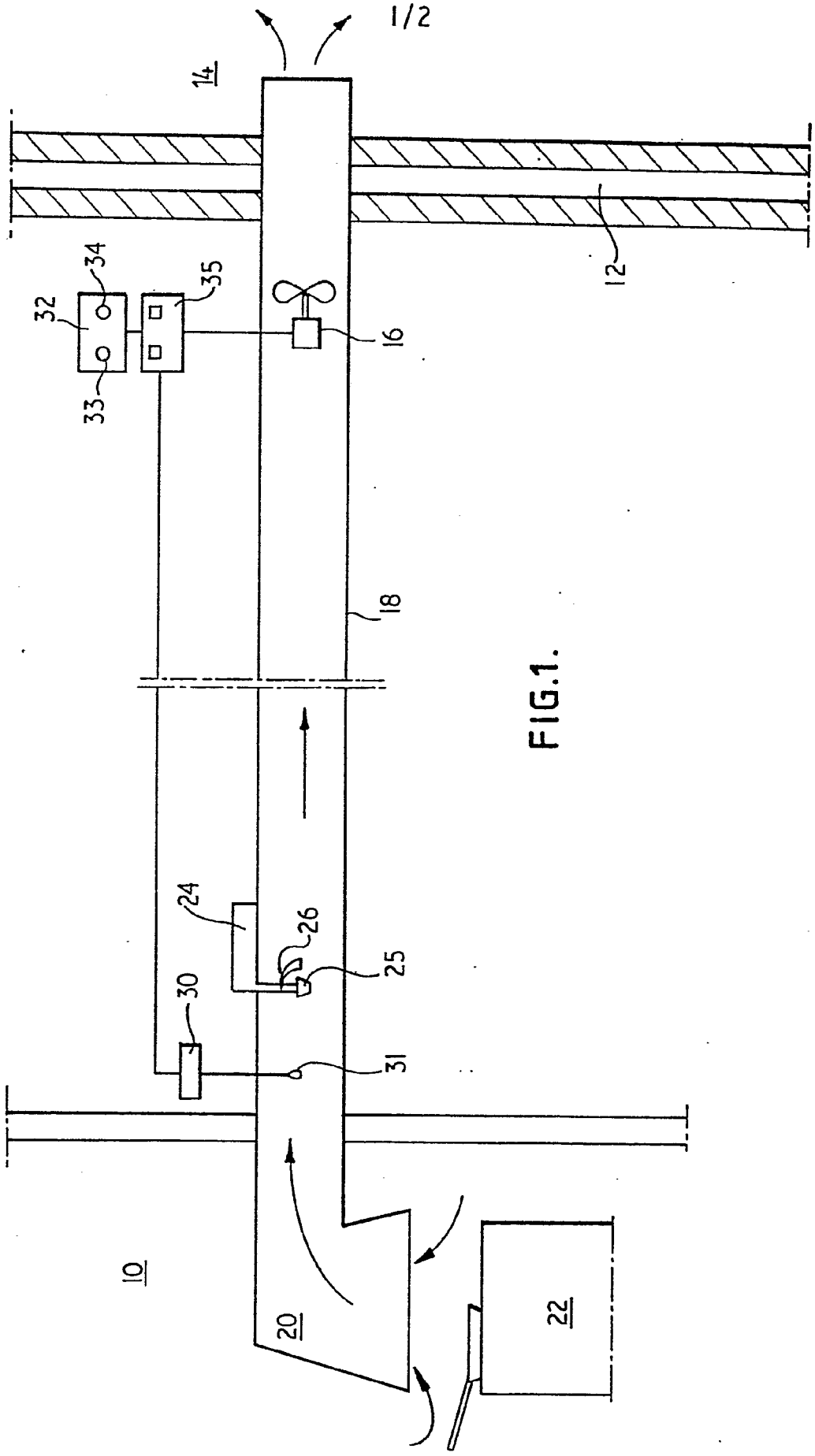
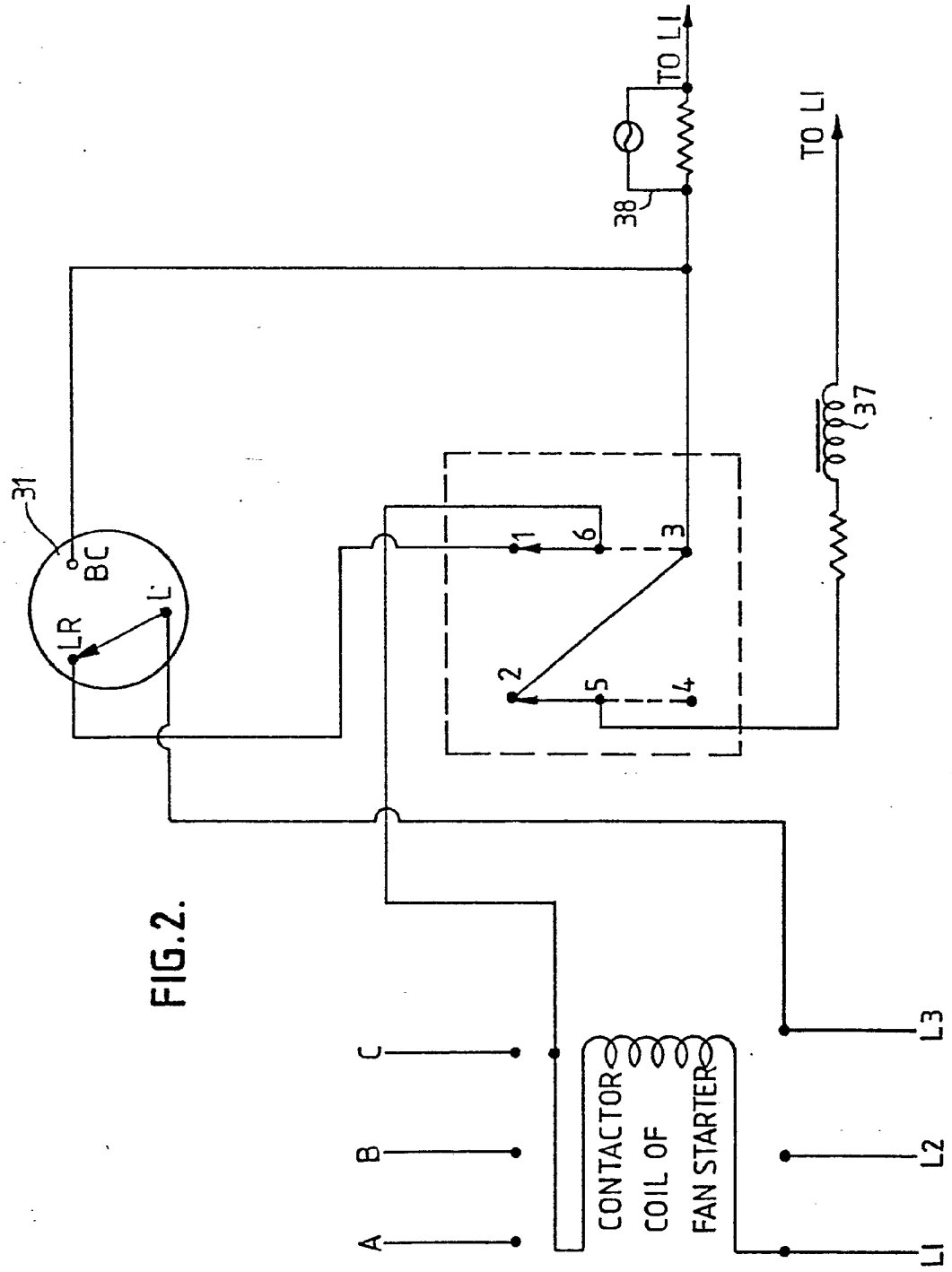


FIG.1.


TO LI
TO LI
38
37
31
BC
LR
L
1
6
3
2
5
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C
B
A
CONTACTOR
COIL OF
FAN STARTER
L3
L2
LI

FIG.2.