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[56]

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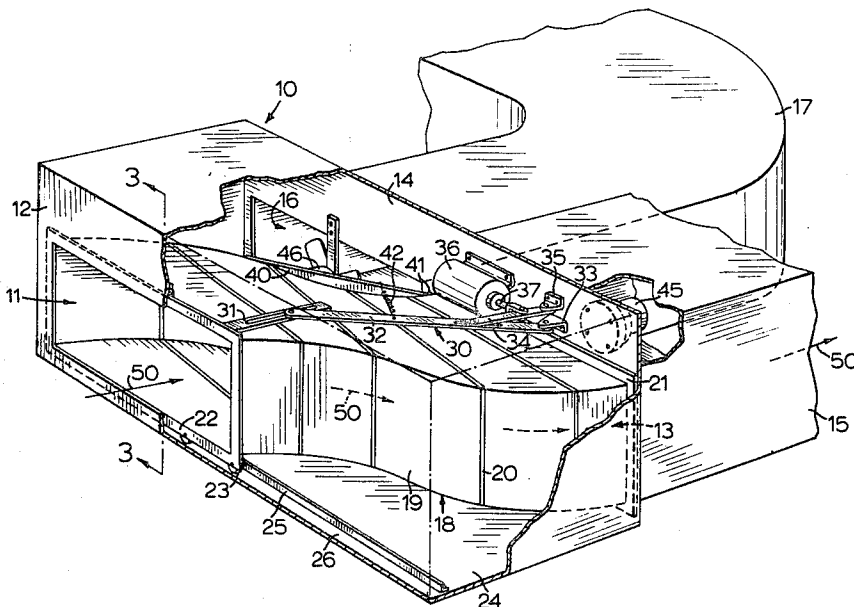
[54] SMOKE AND FIRE ISOLATION DEVICE
8 Claims, 3 Drawing Figs.

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137/119, 137/610, 236/49

[51] Int. Cl. E05f 15/20,
F24f 11/02

[50] **Field of Search**..... 98/1, 86,
115 (LH); 137/119, 610; 236/49; 169/(Inquired)

ABSTRACT: A device for the isolation of smoke and fire in a ventilation system, in which an impervious box is interposed in the ventilation duct. The box has a pair of laterally offset openings in opposite walls of the box with a laterally flexible and a longitudinally compressible smoke impervious and fire retardant duct within the box connecting the two openings. The flexible duct is movable laterally out of registration with one of the openings to bear against the adjacent wall or equivalent plate means, with the consequent compression of the flexible duct providing a positive seal for the duct.



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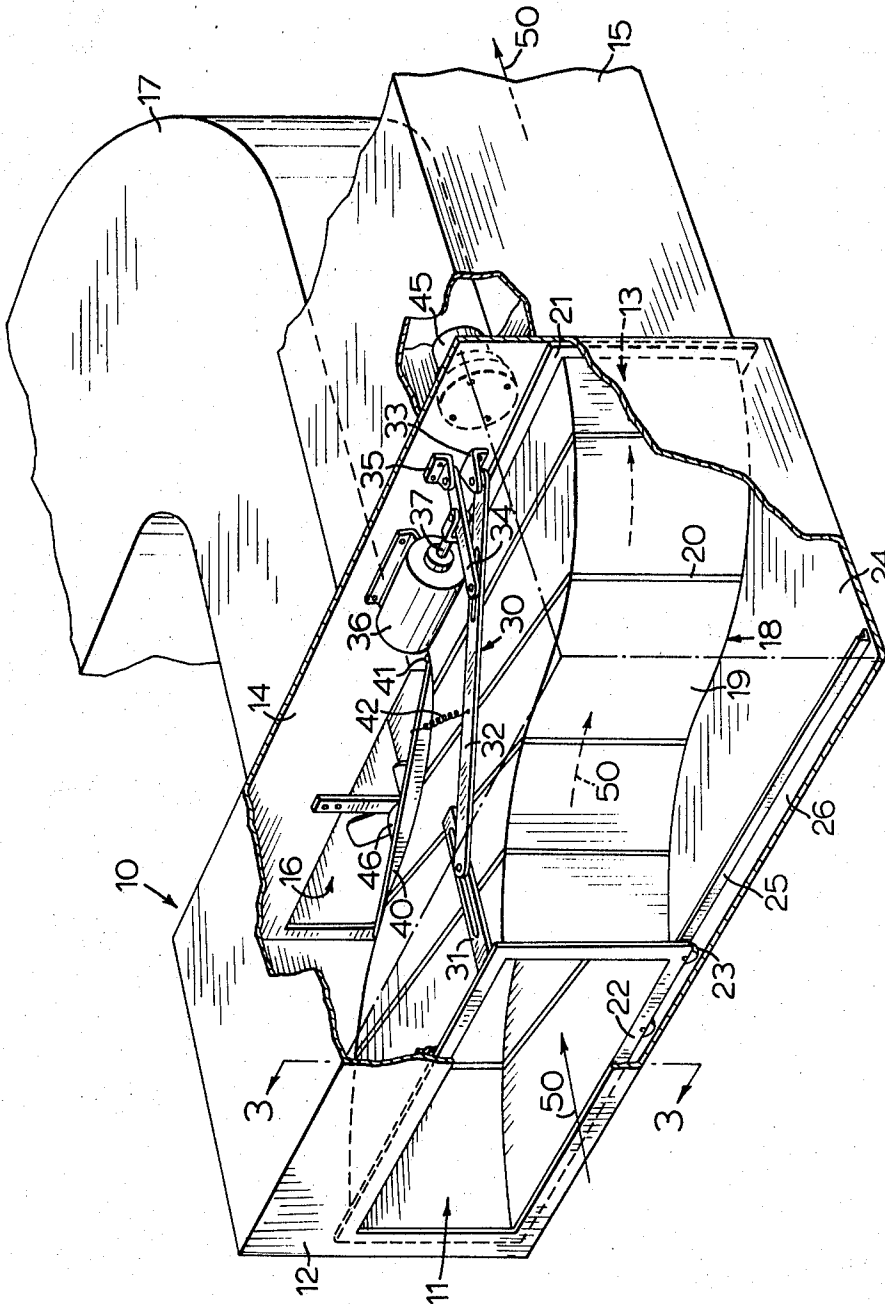


FIG. 1

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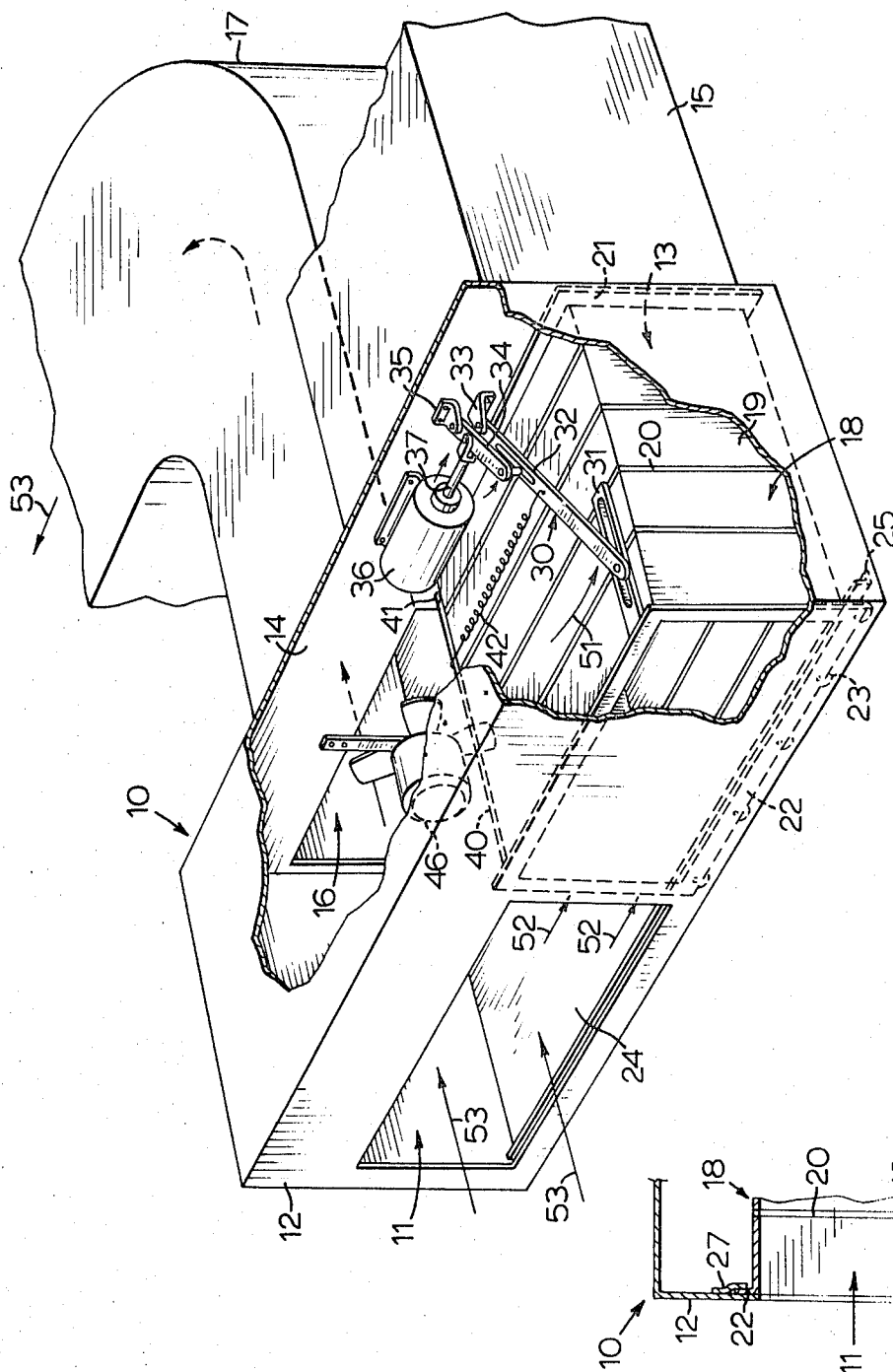
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SMOKE AND FIRE ISOLATION DEVICE

The present invention relates to a device for preventing smoke and fire from travelling through a ventilation system, for example in an air-conditioned building.

One of the great hazards of fire is its ability to travel quickly through a building. The ventilation system of the building provides a path for the fire to spread from one room to another, often cancelling the value of fire walls. Smoke is also a hazard since it causes both panic and asphyxiation. The ventilation system equally provides a path for the smoke to spread through a building, aided by the operation of the circulatory apparatus or by updrafts. Building codes of most jurisdictions recognize this danger of the spread of smoke and fire, by providing regulations specifying the use of dampers in the ducts of the ventilation system. The problem with dampers presently in use, especially larger dampers, is their inability to provide an effective seal against the passage of smoke and fire.

It is an object of the present invention to provide an improved device for isolating smoke and fire in a ventilation system.

An example embodiment of the invention is shown in the accompanying drawings in which:

FIG. 1 is a perspective view of an isolation device, in normal open position, fitted into a return air duct of a ventilation system;

FIG. 2 is a perspective view showing the device of FIG. 1 in closed position; and

FIG. 3 is a view in cross section of the movable end of the flexible duct, taken along the line 3-3 of FIG. 2.

The drawings show a housing or box 10 located in a return air duct. Box 10 has an inlet opening 11 in one wall 12 constituting a bearing plate, and an outlet opening 13 in the opposite wall 14, outlet opening 13 being offset laterally from inlet opening 11 and facing the blank portion of wall 12. In the device shown in the drawings, inlet opening 11 is adapted to register with a building wall aperture (not shown) while outlet opening 13 registers with a return air duct 15. Wall 14 carries a third opening 16 which directly faces opening 11 and registers with a smoke venting duct 17.

A laterally flexible and longitudinally compressible duct 18 is located in box 10 and interconnects openings 11 and 13. In the illustrated embodiment a flexible duct of rectangular cross section is shown, corresponding to rectangular openings 11 and 13. Flexible duct 18 may be made of any suitable fireproof, smoke-impervious flexible material 19, such as Fiberfrax Ceramic Fiberpaper, a trademark applied to ducting manufactured by Mead Corporation and sold by Carborundum Company of Niagara Falls, N.Y. U.S.A., which has a combustion temperature of 970° F. Material 19 of flexible duct 18 is preferably reinforced with circumferential metal ribs 20 spaced along its length.

One end of flexible duct 18 is fixed to wall 14 at outlet opening 13 by a flange 21 while the other end of the flexible duct carries a similar flange 22 which registers with, and circumscribes, inlet opening 11 in the wall 12. Flange 22 lies flat against wall 12 and rests on a plurality of rollers 23 which are journaled mounted on the lower rim of the flange and ride on bottom 24 of box 10. A guide flange 25, fixed to bottom 24, parallel to wall 12, defines a path 26 for movement of rollers 23. As seen more clearly in FIG. 3 of the drawings, the upper rim of flange 22 is slidably restrained against wall 12 by a further flange 27 fixed to wall 12 above inlet opening 11.

Flange 22 of flexible duct 18 is slidable laterally along wall 12 by means of a linkage assembly 30 comprising a longitudinally slotted bar 31 fixed normally to the flange, a longitudinally slotted first pivot bar 32 slidable at one end along slotted bar 31 and pivotable at one end in a first bracket 33 mounted on wall 14 above outlet opening 13 and flange 21, and a second pivot bar 34 slidable at one end along first pivot bar 32 and pivotable at its other end in a second bracket 35 also mounted on wall 14 adjacent first bracket 33. An electrically actuated cylinder and piston assembly 36 is mounted on wall 14 adjacent brackets 33 and 35, with the end of the piston

37 pivotally connected to second pivot bar 34 intermediate the ends of that bar. A metal shield plate or flap 40 is connected on one of its edges to wall 14, adjacent fixed flap 21, by a hinge 41 and is held against the side of flexible duct 18 by a tension spring 42 interconnecting the shield plate with first pivot bar 32. Shield plate 40 is dimensioned to divide box 10 into two compartments when flexible duct 18 is moved into the position shown in FIG. 2 of the drawings.

A smoke and/or thermal detector 45, which may be used to actuate electric motor 36 through a multipurpose control panel (not shown) may be conveniently mounted in return duct 15 on wall 14 above outlet opening 13. Similarly, an exhaust fan 46 also actuated through the same control box, may be mounted on wall 14 centrally in smoke outlet opening 16 leading into smoke venting duct 17.

In the operation of the device, detector 45, on sensing either abnormal smoke or heat in the air passing through the ventilating system, in the direction of arrows 50 in FIG. 1 of the drawings, signals a fire control panel which actuates motor 26 to drive piston 37 outwardly against linkage assembly 30. This moves linkage assembly 30 in the direction of arrow 51 as seen in FIG. 2 of the drawings and moves flange 22 laterally along path 26, guided by flanges 25 and 27, in the direction of arrows 52 as shown in FIG. 2. Flexible duct 18 follows the movement of its flange 22 and, in doing so, it is compressed longitudinally as its central axis is straightened and shortened. The compression of flexible duct 18 acts to press flange 22 against wall 12, providing an effective seal for the duct when in closed position and completely removed from inlet opening 11. Piston 37 of motor 36 is urged outwardly by spring means, (not shown) until the motor is reset to register flange 22 with inlet opening 11 and reopen duct 18.

When flexible duct 18 is closed in this manner, air flow through inlet opening 11 is redirected through outlet opening 16 into smoke duct 17, as indicated by arrows 53 in FIG. 2. As duct 18 is moved into closed position, spring 42 causes shield plate 40 to follow the lateral movement of the duct, and the shield plate takes up a position as shown in FIG. 2 to protect duct 18 against heat and flames entering box 10 through inlet opening 11. The use of shield plate 40 is optional but preferred.

The device of the invention could also be installed in an air supply system. With such an installation the airflow through the device would be in the same direction as shown in the described embodiment but wall 14 would not carry a smoke opening 16. Of course if no smoke venting system is associated with the air return system, then no outlet opening 16 would be required in the described embodiment.

It will be appreciated that the present invention provides a positive seal against leakage of smoke and hot air by employing the force of flexible duct 18 when compressed. This effectively shuts off all smoke laden air from entering the return air system through duct 15 and leaving the area of contamination. Similarly, where the invention is installed in an air supply system the oxygen supply is prevented from entering the area of contamination and aiding combustion.

I claim:

1. A smoke and fire isolation device for a ventilation system comprising:

- a box having smoke impervious and heat retardant walls forming a closed chamber, a first opening and a second opening in opposed walls of the chamber, said openings being offset longitudinally and laterally one from the other and adapted to be connected in a ventilation duct;
- a laterally flexible and longitudinally compressible impervious duct located within the chamber and connecting said spaced openings;
- bearing plate means extending laterally from the first opening and facing the second opening; and
- means to move that end of the flexible duct connected to the first opening laterally therefrom to bear wholly against the bearing plate means whereby the flexible duct is compressed and a seal is effected between the flexible duct and the bearing plate means.

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2. A device as claimed in claim 1 in which the moving means is actuated by the actuation of smoke or heat detection means.

3. A device as claimed in claim 1 in which the bearing plate means is that wall of the box carrying the first opening.

4. A device as claimed in claim 1 including a third opening facing the first opening and adapted to be connected to a smoke venting duct, and including a fire and heat retarding shield plate hinged adjacent the second opening, the shield plate lying against the flexible duct and removable therewith into a closed position separating the flexible duct from the first and third openings.

5. A device as claimed in claim 1 in which the flexible duct comprises a smoke impervious and heat retarding fabric reinforced by spaced metal banding.

6. A device as claimed in claim 1 in which the opposed walls of the chamber are parallel, the flexible duct having a circumferential flange mounted on the movable end thereof, that wall of the chamber carrying the first opening comprising the bearing plate and having the flange slidable thereon.

7. A device as claimed in claim 6 including track means fixed to the bearing plate, and roller means journally mounted on the flange and movable along the track means.

8. A device as claimed in claim 1 in which the moving means comprises a linkage assembly mounted adjacent the second opening and connected with the movable end of the flexible duct, and motive means adapted on actuation to move the linkage assembly.

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