United States Patent

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[54] **AIR VANE AND FIRE DAMPER FOR INTEGRATED CEILING SYSTEMS AND THE LIKE**

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[52] **U.S. Cl.**.....**98/40 D**, 98/1, 137/75

[51] **Int. Cl.**.....**F24f 13/08**

[58] **Field of Search**.....98/1, 40 D; 137/72, 74, 75

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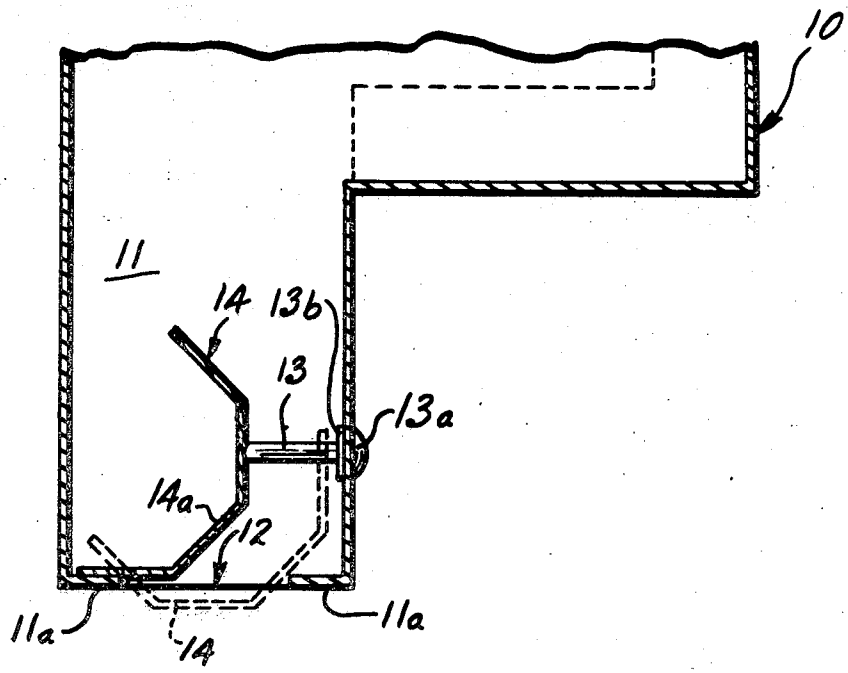
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[57] **ABSTRACT**

An air vane is inserted in the air passage of an air diffuser and extends longitudinally above the lower portion of the outlet (the inlet if a return air unit) slot. The air vane is supported at its lower surface by resting on a horizontal surface forming one side of the outlet slot of the air passage. One or more pin members may be either fixedly attached to the vane itself or to a side portion of the air passage. This pin member will be constructed of a suitable material, having a low melting point, so that when a fire occurs in a room area below the ceiling system utilizing the subject air vanes, the pin member will melt and vaporize thereby allowing the vane to fall downwardly and close off the outlet slot thereby providing a fire stop damper.

10 Claims, 4 Drawing Figures



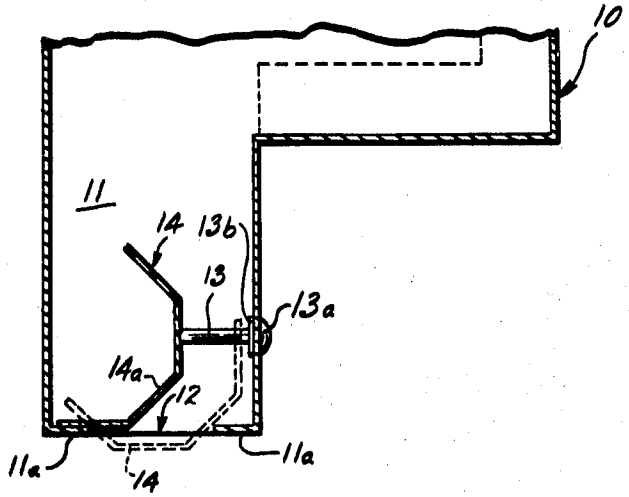


Fig. 1.

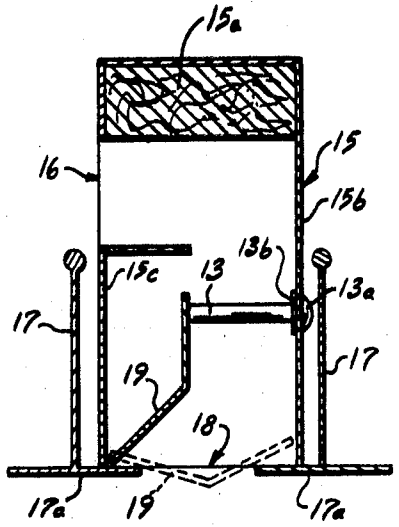


Fig. 3.

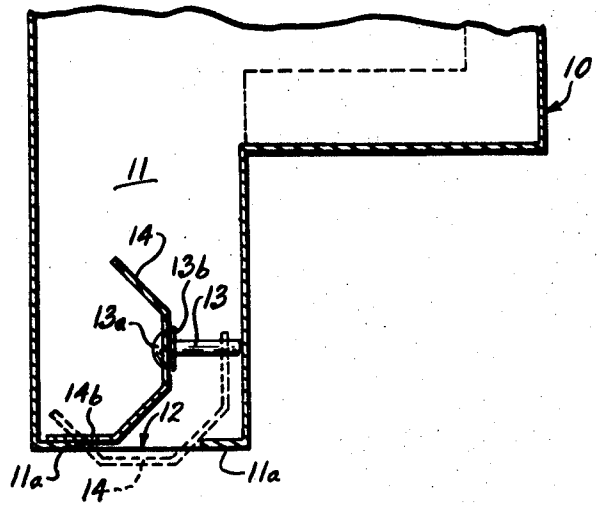


Fig. 2.

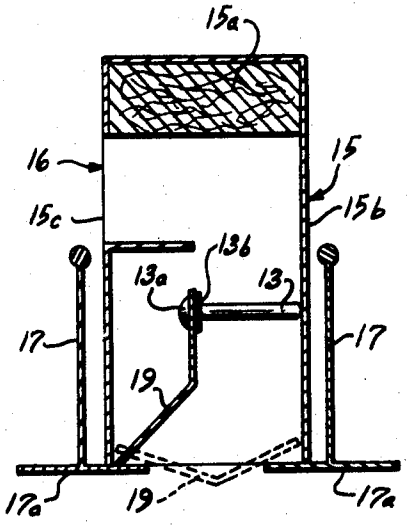


Fig. 4.

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AIR VANE AND FIRE DAMPER FOR INTEGRATED CEILING SYSTEMS AND THE LIKE

BACKGROUND AND BRIEF DESCRIPTION OF THE INVENTION

Integrated ceiling systems which utilize fixtures of units to illuminate, ventilate, and/or air condition the room or room area associated therewith are an art recognized concept. The advantages of such a system are well known with respect to sound control, heating, air conditioning and ventilating features as well as the aesthetic appearance. In order to accommodate the various ventilating and temperature control diffusers and return air ducts, longitudinal slots (inlet and outlet) are generally located in the ceiling system adjacent a T-bar structure or, in the alternative, the diffuser itself sometimes is elongated and constructed to utilize the lower portion thereof as both an outlet slot and as a means for supporting either the fixtures or the ceiling panel portions of the ceiling system. With such an arrangement, a fire started within the room area (or in the ceiling plenum) may spread through the outlet slots mentioned above to the immediately adjacent area before sprinkler systems or alarms can react efficiently. Since the ceiling panels and fixtures generally associated with modern ceiling systems are generally fireproof, the prospect of fires spreading through ceiling systems has proven in the past to be very real and dangerous.

Our invention relates both to a uniquely constructed air vane and diffuser combination and to the turning or deflecting air vane in a supporting pin member which will vaporize and melt at preselected temperatures to permit the air vane to automatically close a diffuser or air passage outlet slot when fire danger is imminent.

It is contemplated that the air vane may be utilized with the lower end or outlet air passage of an air diffuser having horizontally turned flanged (or lip) portions forming the outlet slot or with two T-bar like structure which are securely held a spaced distance apart and supporting either return air unit of air inlet dampers for diffuser boots of the various designs. In any event, the outlet slot of either the diffusers or the T-bars have inner horizontal supporting surfaces for the air vane. Further, one or more pin members, having a preselected melting point may be either fixedly attached to the vertical side of the air passage or attached to the air vane itself. The former construction permits the air vane to be located in the air passage so as to direct the air therethrough in only one direction. If, however, the pin member is fixedly attached to the air vane, the air vane may be rotated to deflect the air through the air passage and out the outlet slot in opposite directions adjacent same. Both constructions permit the pin member to vaporize and melt upon the attainment of a preselected ambient temperature condition and to thereby allow the air vane to fall on the horizontal supporting surfaces of the air passage effectively closing off same and acting as a fire damper.

In actual practice, the turning or deflecting air vane can assume various shapes when used in combination with either the air diffuser or T-bar diffuser structure shown in the various views. We have found that a V-shaped, generally arcuate shaped, or vane structure having three of more integrally formed longitudinal surfaces are satisfactory when utilized in the manner disclosed in more detail hereinafter.

One of the principal objects of the invention is to provide a uniquely constructed turning or deflecting air vane for use with T-bar and other air diffusers.

Another object of the invention is to provide an air vane structure which is insertable and positionable within a T-bar or other type air diffusers from below same. It is an important feature of the invention that the diffuser structure may be a part of an integrated ceiling system and that the air vanes are installable and positionable after the diffusers are in place.

A still further object of the invention is to provide a turning or deflecting air vane which is uniquely constructed to cooperate with the air diffusers and the like to direct the air flow along the underside of the ceiling system adjacent one side portion of the outlet slot in the diffuser unit.

Another primary object of the invention is to provide a uniquely constructed air vane which acts in combination with air diffuser units to shut off the outlet slot of same thereby providing fire damper action when the temperature in and around the vane structure is a preselected value.

A still further object of the invention is to provide an air vane of the character described immediately above which is supported in an air transferable position by a pin member or members having a relatively low melting point and which will vaporize and melt upon the attainment of a preselected temperature. It is an important feature of the invention that when the pin member or members melt, they no longer support air vane in an "open slot" position and the vane is permitted to fall into a position that completely shuts off the outlet slot of T-bar or conventional air diffusers.

Other and further objects of the invention, together with the features of novelty appurtenant thereto, will appear in the course of the following description.

DETAILED DESCRIPTION OF THE INVENTION

In the accompanying drawing, which forms a part of the specification and is to be read in conjunction therewith and in which like reference numerals are employed to indicate like parts in the various views:

FIG. 1 is a sectional view of the lower portion of an air diffuser with the turning or deflecting air vane shown both in solid and broken lines and with one of the associated pin members with a low melting point being fixedly attached to the right-hand side portion of the air diffuser outlet air passage. The solid line view of the air vane indicates the position that permits air flow through the outlet slot while the broken line position indicates the fire damper position;

FIG. 2 is a view similar to FIG. 1, however showing the low melting point pin members being fixedly attached to the air vane and contacting the inner right-hand wall of the diffuser outlet air passage;

FIG. 3 is a sectional view of a T-bar mounted air diffuser or return air unit showing a different configuration for the air vane (in both solid and broken lines) and with the low melting point pin member being fixedly attached to the right-hand wall of the diffuser in the solid line view; and

FIG. 4 is a view similar to FIG. 3 with the air vane having the low melting point pin member fixedly attached thereto and contacting the right-hand wall portion of the diffuser unit.

Turning now more particularly to the drawing, reference numeral 10 generally designates an air diffuser unit having a lower outlet air passage 11 with outlet slot 12 defined in the lower horizontal portion thereof.

The air passage 11 is generally an elongated rectangular structure having two horizontally turned opposed lower flanged portions (or lips) 11*a* whose inner edges form the outlet slot 12. It is contemplated that these air diffusers may be supported on the horizontal flanges of the T-bar or, alternatively, the lower outer side portions of the air passage 11 may take on a T-bar profile and be hung from a false ceiling as part of the T-bar grid.

FIG. 1 shows a plastic pin member 13 extending through the right-hand wall of the air passage with the headed end 13*a* bearing against the exterior surface of same. A lock washer 13*b* (or other locking device) fixedly locates the pin member with respect to the right-hand side for air vane supporting purposes. As suggested above, the plastic pin member will have a melting point that is sufficiently low to indicate the pretense of fire or excessive heat. The pin member (or members) may be either hollow or solid with sufficient stiffness to remain in a horizontal plane and to contact one surface of the turning or deflecting air vane which will be described in more detail later. It is contemplated that the air passage 11 of the outlet diffuser 10 may be appropriately apertured and the pin member inserted on either the right or the left-hand side (as seen in FIG. 1) depending on the desired direction of air flow through outlet slot 12.

The air vane, generally indicated by the numeral 14, is shown in solid line in FIG. 1 as being supported on the left-hand horizontal flange 11*a* and by the end extremity of pin member 14. The air vane shown therein has approximately four angled sides and is integrally formed in an over-all arcuate shape when viewed from the end. This construction (the combination air vane and diffuser) directs the air flow through the diffuser housing and into air passage 11, and out outlet slot 12. More specifically, the air vane 14 directs the flow of air between the right-hand surface of the air vane and the right-hand wall of the air passage. The air flow will initially contact the upper surface of the right-hand horizontal lip 11*a* and be deflected to the left (as shown in FIG. 1) through outlet slot 12 with this air flow being assisted by the angled side 14*a* of the vane 14. It is contemplated that the air vanes could be of any desired length and may be alternately oriented within the air passage 11 of a single diffuser housing to stagger the air flow along the underside of the ceiling system adjacent the outlet slot 12. Further, it has been found that such a structure creates a Coanda effect and causes the flow of air to substantially hug the ceiling. This structure is effective in eliminating drafts and other undesirable air distribution phenomena and optimizes temperature and pressure comfort in room area being conditioned by integrated ceiling systems.

As suggested above, the pin member (or members depending on the length of air vane 14, there may be a plurality of pin members 13 to provide proper support for the vane 14) is constructed of a material having the above-mentioned low melting point. If a fire would start in the room area or in the ceiling plenum, the temperature in and around pin member 13 would eventually rise toward the melting point causing pin member 13 to essentially vaporize of otherwise collapse. With the loss of the pin member rigidity, same ceases to function as a supporting member for vane 14. As a result, vane 14 will fall to the broken line position shown in FIG. 1 thereby shutting off outlet slot 11 and precluding fire from spreading through the outlet slot to other portions of the room area (either to the plenum area or to the room area).

The view shown in FIG. 2 is substantially similar in operation to that shown with respect to FIG. 1, however it should be pointed out that pin member 13 is now fixedly attached to the vane member 14. The operation both during an open slot condition and when acting as a fire damper is substantially the same. It is significant however, to point out that with the pin members attached to the vane, the vane is optionally positionable with the horizontal surface 14*b* relocated on the right-hand horizontal flange or lip 11*a* instead of the left-hand horizontal flange (as shown in FIG. 2) thereby effectively causing the flow of air through outlet slot 12 to be to the right of the diffuser as opposed to the left as previously described.

From the above, it is seen that the structure in FIG. 1 requires that the pin members be rotated to the opposite side portion of air passage 11 before the vane may be positioned to direct the flow of air in an opposite (to the right of slot 12) direction. However, with the pin member attached to the vane as in FIG. 2, the vane may simply be reversed and the flow of air will be in the desired opposite direction. In any event, both the vane structures with the associated low melting point pin members will cause the unit to act as a fire damper and seal off the outlet slot of the diffuser from any spread of fire through same.

Turning now to the embodiment shown in FIG. 3, reference numeral 15 generally represents a return air unit. The return air unit will have a fiber glass insulating material 15*a* located in the upper portion thereof with the outlet slot generally indicated by the numeral 16. The vertical side walls 15*b* and 15*c* are constructed to be supported on T-bars 17 which may be suspended from the false ceiling and held together by conventional T-bar spacers (not shown). In any event, the T-bars 17 have horizontal inner flanges 17*a* which support the lower edge extremities of the return air side wall 15*b* and 15*c* along the length thereof. The numeral 18 generally represents the inlet to the return air 15.

The air vane 19 is of a different shape in that shown with respect to vane 14, same being substantially V-shaped. Vane 19 is, however, supported on the inner left horizontal flange 17*a* of T-bar 17 and by a low melting point pin member 13 which is similar to that described with respect to FIGS. 1 and 2. Accordingly, pin member 13 assures that inlet 18 to the return air has a direct passage to outlet 16.

In operation, when the ambient temperature in and around the pin member 13 exceeds the preselected critical value, pin member 13 melts or vaporizes thereby permitting the V-shaped vane 19 to fall to the broken line position shown in FIG. 3 and to act as a fire damper sealing off outlet 18 from possibly transmitting a flame therethrough.

The embodiment shown in FIG. 4 is substantially similar to the return air and vane combination shown in FIG. 3 with the exception that the pin member is once again attached to the vane as opposed to being fixedly located on the right-hand wall of the return air unit. Again, the pin member 13 operates to melt or vaporize at a preselected temperature and to assume that position shown by broken lines thereby sealing off the inlet to the return air in the case of a fire.

It should be pointed out that in all embodiments the vane may be reversed to blank off the associated slots. Also, in each instance the vane may be either inserted or removed from the associated air passage from below same after the diffuser or return air unit is integrated into the ceiling system.

From the foregoing, it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. In an air diffuser or return air device suitable for use in integrated ceiling systems, the combination therewith of

an air passage,

a longitudinal slot defined in said air passage, said slot forming at least a portion of an opening into a room area being temperature conditioned,

a removable air vane,

means for supporting said air vane within said passage in a position to direct air flow through said slot, said vane being removable from said passage without the use of tools, said supporting means including a means for permitting the vane to move to an air flow shutoff position at a preselected temperature.

2. The combination as in claim 1 wherein said longitudinal slot is formed by at least two horizontal surfaces operably associated with said air passage, said vane being supported on a first edge portion thereof by at least one of said horizontal surfaces,

said vane permitting moving means including at least one pin member, said pin member being located between a side portion of said air passage and a surface portion of said vane.

3. The combination as in claim 2 wherein said pin member is constructed of a material having a preselected melting point.

4. The combination as in claim 3 wherein said melting point corresponds to a temperature indicative of a fire within the vicinity of said vane, said vane thereby closing said longitudinal slot and precluding the spread of fire therethrough when said pin member melts.

5. The combination as in claim 1 wherein said air passage has at least one horizontally oriented flange forming a side portion of said slot, said vane being supported to define a longitudinal space between same and said flange, said vane and flange cooperating to deflect the air flow through said diffuser away from said flange and along the underside of a ceiling system adjacent said slot.

6. The combination as in claim 5 wherein said air passage has at least two horizontally oriented flanges forming the two longitudinal side portions of said slot, said vane being supported on a first edge portion thereof by at least one of said horizontally oriented flanges, said vane permitting moving means including at least one pin member, said pin member being located between a side portion of said air passage in the second edge portion of said vane.

7. The combination as in claim 6 wherein said pin member is constructed of a material having a preselected melting point.

8. The combination as in claim 7 wherein said melting point corresponds to the temperature indicative of a fire withing the vicinity of said vane, said vane thereby closing said longitudinal slot and precluding the spread of fire therethrough when said pin member melts.

9. The combination as in claim 1 wherein said air diffuser or return air device is supported on the horizontal flanges of two spaced apart parallel T-bars, said air vane being supported on one of said horizontal flanges and said supporting means supporting the opposite side portion of said vane from said air passage to permit air to flow through said longitudinal slot.

10. The combination as in claim 9 wherein said vane permitting moving includes at least one pin member sensitive to a fire condition within the proximity of same vane, said member operable to cease functioning as a supporting means at a temperature corresponding to said fire condition thereby permitting said vane to more to said shutoff position.

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