United States Patent

[11] **3,575,229**

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[54] **SMOKE SEAL FOR CURTAIN-TYPE FIRE DAMPERS**
4 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** 160/1, 98/1, 98/114, 126/285R, 160/84R
[51] **Int. Cl.** **E05f 15/20**
[50] **Field of Search** ..... 160/1—9, 84; 49/419, 414, 74, 90, 91, 371, 480; 98/114, 86, 1; 126/285, 1, 86

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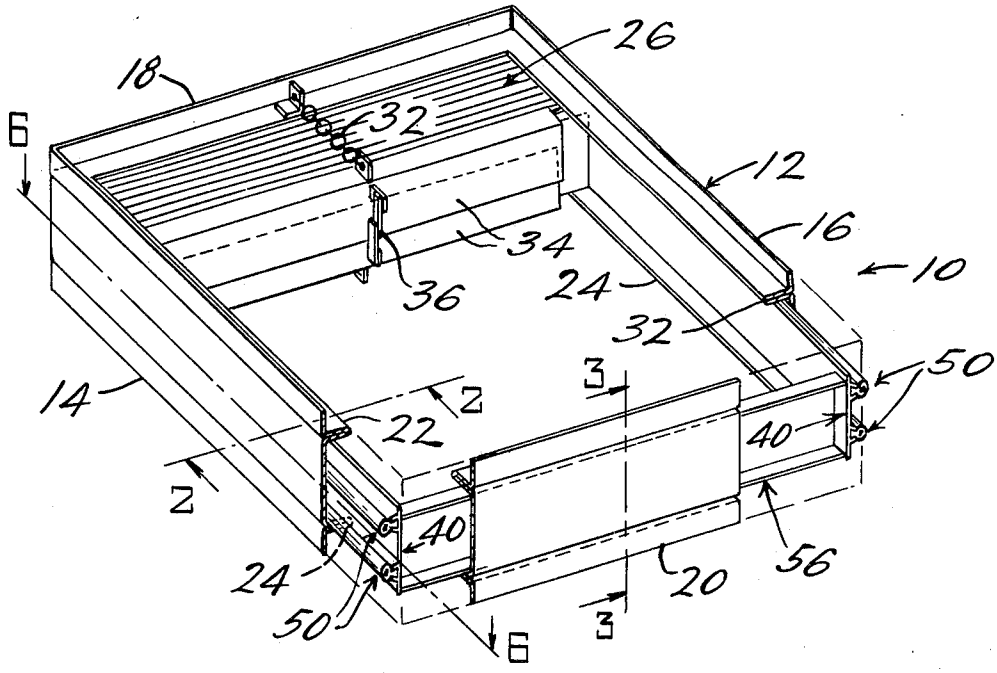
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Assistant Examiner—Philip C. Kannan
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ABSTRACT: A smoke seal for a curtain-type fire damper is provided. The seal comprises two metal strips located adjacent the side frame members of the fire damper, each being urged inwardly by a pair of resilient strips therebehind. The extent of inward movement of the strips is restricted by suitable stops located adjacent one end-frame member of the fire damper. The strips contact the ends of the fire damper blade sections when they are closed to provide an effective smoke seal therebetween.



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SHEET 1 OF 2

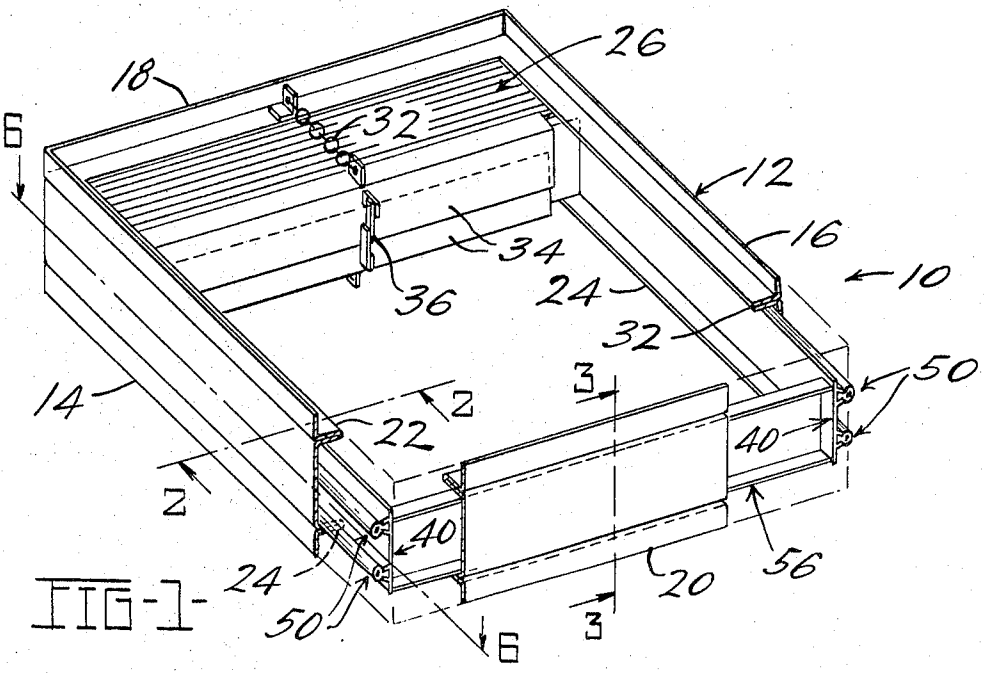


FIG-1-

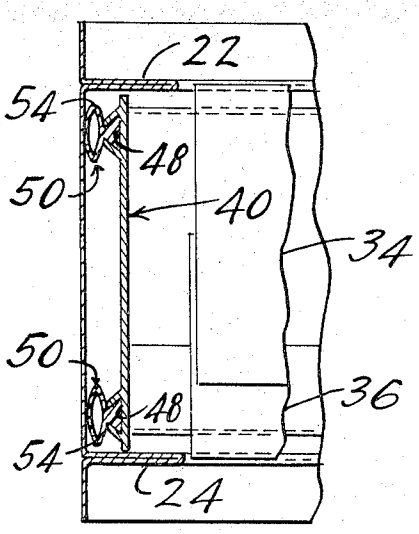


FIG-2-

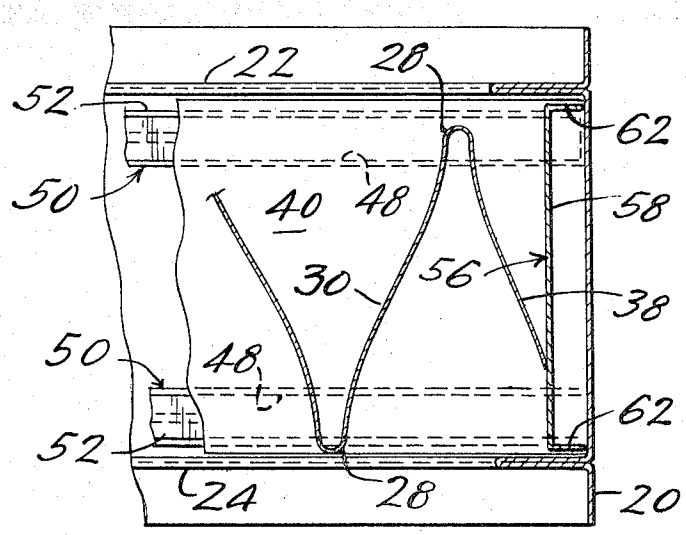


FIG-3-

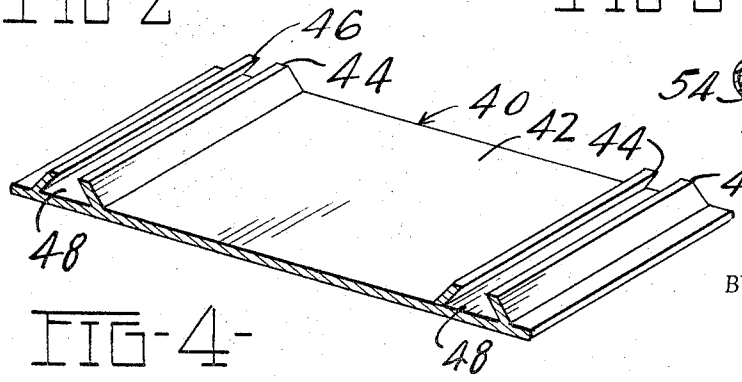


FIG-4-

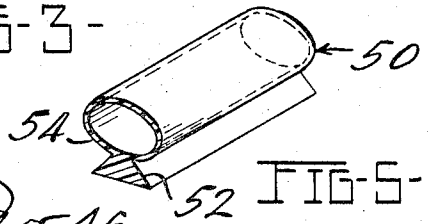


FIG-5-

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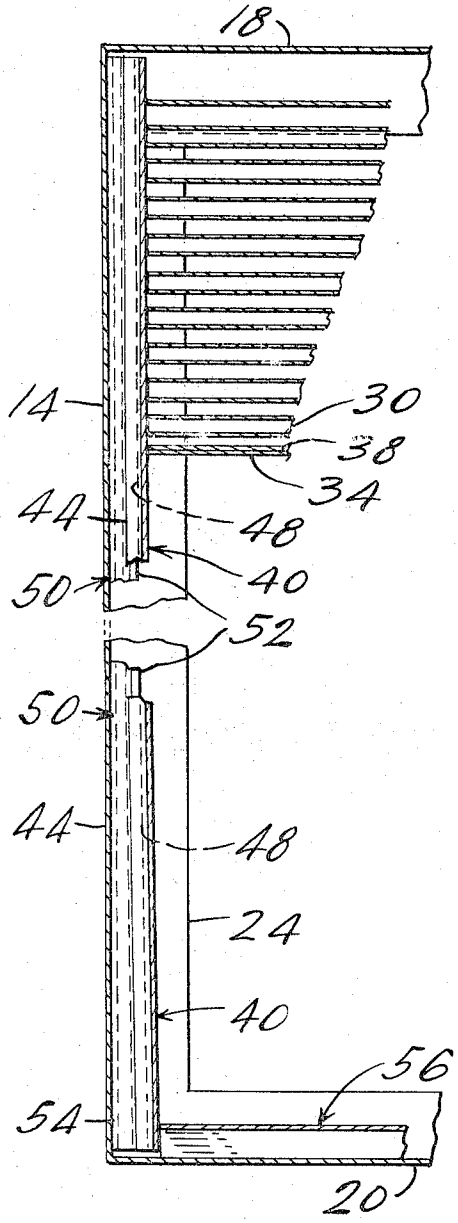


FIG - 6 -

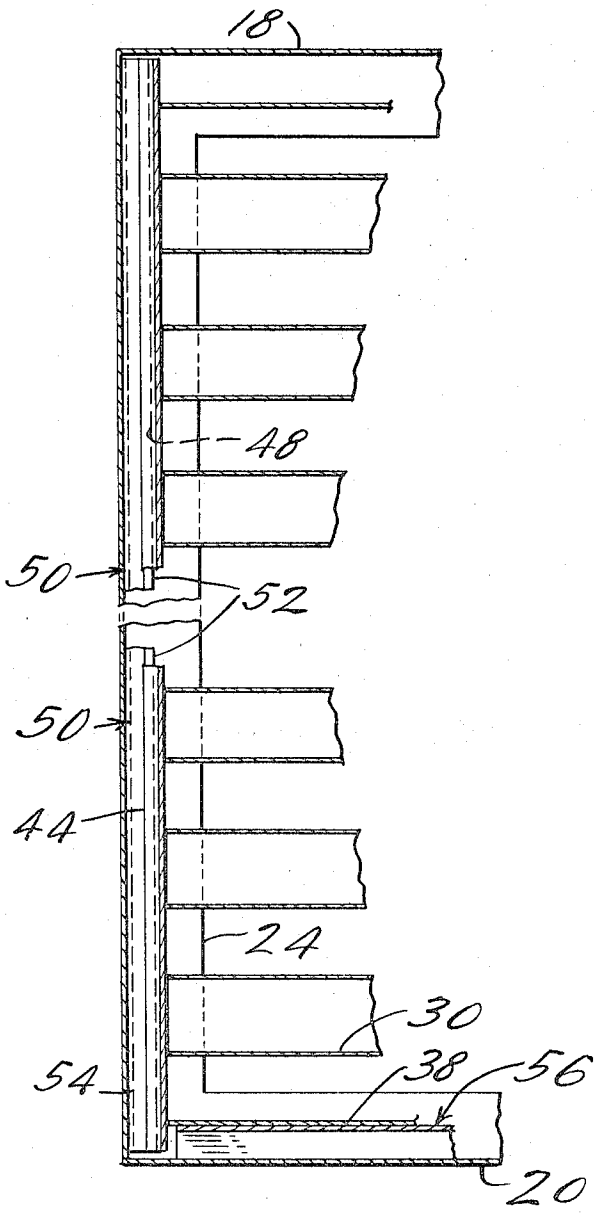


FIG - 7 -

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SMOKE SEAL FOR CURTAIN-TYPE FIRE DAMPERS

This invention relates to a seal for a fire damper and particularly to a smoke seal for a curtain-type fire damper.

The advisability of employing fire dampers particularly in commercial buildings has been strengthened over recent years. As more fire dampers are employed, the requirements or specifications for such dampers have also been tightened. More recently, the need to make such fire dampers smoketight for a reasonable period of time to enable people to evacuate the endangered premises has become more fully realized. Heretofore, seals have been proposed for fire dampers but have not been satisfactory. Such seals have been expensive and usually involved moving parts in the nature of hinged members which are subject to becoming stiff and inoperative over a period of nonuse. Consequently, where smoke seals have been desired or required heretofore, it has been common to use a conventional fire damper and add a separate smoke damper downstream of the fire damper. The use of two dampers, of course, has been expensive and, further, if the duct work between the two should fail, then the smoke will bypass the smoke damper and render it ineffective.

The present invention relates to a smoke seal in combination with a fire damper of the curtain type and particularly having integral blade sections normally held in a retracted position at one end of the damper and movable thereacross when released to close the damper. Such a damper is shown in a copending application of Johnson and Alley, Ser. No. 660,449. The seal according to the invention includes continuous, imperforate strips of metal located adjacent the side frame members of the damper and preferably between two spaced inwardly extending flanges thereof. A pair of resilient strips are located between the metal strips and the side frame members to urge the metal strips inwardly toward the opening of the damper. The extent of movement inwardly is limited at the one end of the damper by the retracted blades and stop means are provided at the opposite end of the damper to limit the inward movement of the metal strips at that end. The distance between the metal strips at the latter end preferably is slightly less than the length of the blade sections of the damper. With this arrangement, the damper can close fully with all blade sections in contact with the metal strips, yet without undue interference of the closing action of the blades by the metal strips.

An effective and reliable, as well as low cost, seal is provided with this arrangement. Further, the seal is effective at least until the temperature thereof rises to 300°—500° F. By this time, all occupants should have evacuated the building, at which time the smoke seal is no longer important.

It is, therefore, a principal object of the invention to provide a fire damper with a smoke seal having the advantages outlined above.

Other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a view in perspective of a fire damper embodying the invention with portions of the frame shown in phantom;

FIG. 2 is a fragmentary view in transverse cross section taken along the line 2–2 of FIG. 1;

FIG. 3 is a fragmentary view in cross section taken along the line 3–3 of FIG. 1, but with the blade sections in a closed position;

FIG. 4 is a view in perspective of a portion of a side sealing strip of the fire damper;

FIG. 5 is a view in perspective of a portion of a resilient strip used with the sealing strip of FIG. 4 to urge the sealing strip inwardly;

FIG. 6 is a fragmentary view in longitudinal cross section taken along the line 6–6 of FIG. 1; and

FIG. 7 is a fragmentary view in cross section similar to FIG. 6 but with the blade sections in the closed position.

Referring particularly to FIG. 1, a fire damper embodying the invention is indicated at 10 and is shown in a horizontal position, as when mounted in a vertical duct or in a ceiling of a building. The fire damper 10 includes a frame 12 having side frame members 14 and 16, and end frame members 18 and 20. All four of the frame members can have the same transverse cross-sectional shape, including inwardly extending flanges 22 and 24 which act as guides and also aid in sealing the damper, when closed.

The fire damper 10 also includes a metal sheet 26 which is curved or folded in opposite directions at spaced, predetermined intervals, as along folds or fold lines 28, to form adjacent integral blade sections 30. One end edge of the sheet 26 is affixed to the end frame member 18 by suitable fasteners. When the sheet is in the retracted position, it is retained by suitable chains 32 and angle members 34 which are connected by a fusible link 36 or any other sensing device which is actuated by products of combustion. With the sheet in the retracted position, the adjacent blade sections 30 are in a stressed condition so that when the fusible link 36 is parted, the blade sections spring quickly toward the end frame member 20 to a closed position, as shown in FIGS. 3 and 7. This closing action can be quite strong, due to the stressed condition of the blades, with no additional springs or other closing means being required, whether the damper is positioned horizontally or vertically.

When the blade sections 30 are closed, an effective smoke seal is established at the end frame member 18 since the end edge of the sheet 26 is affixed to that frame member. Also, an effective smoke seal is provided at the end frame member 20 by an end blade section 38 which is retained in position by gravity when the fire damper 10 is mounted in a vertical position or which can be retained in position with the aid of latch members (not shown) as disclosed in my copending application Ser. No. 819,243 when the fire damper is mounted in a horizontal position.

The edges of the blade sections 30 adjacent the side frame members 14 and 16, however, do not normally provide as effective seals since some clearance must be incorporated between the side frame members and the edges of the blade sections 30. To overcome this problem, metal sealing members 40 are provided for the side frame members 14 and 16 between the inwardly extending flanges 22 and 24 thereof. Each of the sealing members 40 includes a flat metal strip 42 which extends longitudinally of the side frame members between the end frame members 18 and 20. The strip 42 has two pair of flanges 44 and 46 on the rear thereof which form grooves 48. Resilient strips 50 have generally triangular-shaped tongues 52 which are received in the grooves 48 and held thereby. The strips 50 also have bulbous portions 54 which are sized such as to bear against the side frame members 14 and 16 between the flanges 22 and 24 and urge the sealing strips 42 inwardly.

Various other resilient means can be employed in association with the sealing strip 42. The resilient strips 50 function satisfactorily, however, in urging the strips 42 inwardly as well as in forming seals between the sealing members 40 and the side frame members 14 and 16. While the resilient strips 50 may fail at a temperature of 300°—500° F., by this time, the building should long have been evacuated. Further, even with failure of the strips, the fire damper is still effective to block passage of flames thereby. If desired, however, resilient metal strips can be employed for higher temperature resistance.

At the ends of the side frame members 14 and 16 toward the end frame member 18, the extent of inward movement of the sealing members 40 is limited by contact with the edges of the blade sections 30. At the opposite end of the fire damper 10, near the end frame member 20, stop means are positioned to limit the extent of inward movement of the sealing strips. As shown in this instance, the stop means are provided by U-shaped stop member 56 which is affixed to the end frame member 20. The stop member includes a flat central portion 58 (FIG. 3) and two edge flanges 60 and 62. The flat central portion 58 provides a seat for the end blade section 38 for sealing purposes and the edge flanges 60 and 62 space the flat

portion **58** from the end frame member **20** so that the stop member **56** engages end portions of the strips **42** and limits the inward movement thereof. Consequently, the ends of the sealing strips **42** toward the frame member **18** are retained in position by the blade sections **30** and the stop member **56** retains the opposite ends of the sealing strips **42**.

As shown in FIGS. **6** and **7**, the stop member **56** is of a length such as to position the corresponding portions of the strips **42** apart a distance slightly less than the length of the blade sections **30** across the fire damper. With this arrangement, the sealing strips **42** engage the edges of the blade sections **30** effectively, when closed, yet do not extend inwardly enough to hamper the closing movement of the blade sections **30**. Tabs or various other stop means can be employed adjacent the end frame member **20** to hold the sealing strips in the aforesaid positions. Regardless of the type of stop means employed, however, such means are important to enable the fire damper **10** to operate with maximum efficiency and reliability.

Various modifications of the above described embodiment of the invention will be apparent to those skilled in the art and it is to be understood that such modifications can be made without departing from the scope of the invention, the embodiment shown and described being primarily for purposes of illustration and not limitation.

I claim:

1. A fire damper comprising two side frame members and two end frame members, a plurality of connected sequential blade sections, an edge of one said blade sections being affixed to one of said end frame members, means holding said blade sections in a retracted position adjacent said one end frame member, a pair of spaced, parallel vertical flanges on the inner side of each of said side frame members and extending inwardly therefrom, the flanges of each pair being spaced apart a distance greater than the width of said blade section, a vertically extending blade edge sealing strip positioned between each of said pairs of vertical flanges and resiliently contacting the ends of said blade sections, and stop means adjacent the other of said end frame members and engaging the corresponding ends of said sealing strips for limiting the inward movement thereof.

2. A fire damper according to claim **1** characterized further by said stop means comprising two flanges extending outwardly from said other end frame member.

3. A fire damper according to claim **1** characterized further by said stop means comprising a pair of flanges extending outwardly from said other end frame member and extending longitudinally thereof, and a flat strip connecting said longitudinally extending flanges and engageable by the last one of said blade sections when the fire damper is closed.

4. A fire damper according to claim **1** in which the sealing strips are flat and there are separate resilient means located between said strips and the respective adjacent side frame members for biasing said strips inwardly.