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Lambert

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[54] **FIRE RESISTANT AIR BAR FOR USE IN A SUSPENDED CEILING STRUCTURE**

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[52] **U.S. Cl.** .....**98/40 D,** 52/DIG. 5

[51] **Int. Cl.** **F24f 13/06**

[58] **Field of Search** ....98/40 D, 40 DL; 52/475, 494, 52/495, DIG. 5

[56] **References Cited**

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Assistant Examiner—William E. Tapolcai, Jr.
Attorney—C. A. Miketta et al.

[57] **ABSTRACT**

The fire resistant air bar has high temperature resistant side rails for supporting the fire resistant ceiling tiles of a suspended ceiling, and for supporting an air plenum chamber; has high temperature resistant spacer bars located between the side rails with end tabs thereof extending through slots in the side rails to fasten thereto; has lower temperature melting spacers mounted on the spacer bars between the side rails; and has nested weir channel members located between the spacers, whereby when the spacers weaken or melt due to high temperature of a fire, the spacer bars maintain the spacing of the side rails to continue supporting the ceiling tiles for blocking the passage of the fire through the suspended ceiling.

9 Claims, 4 Drawing Figures

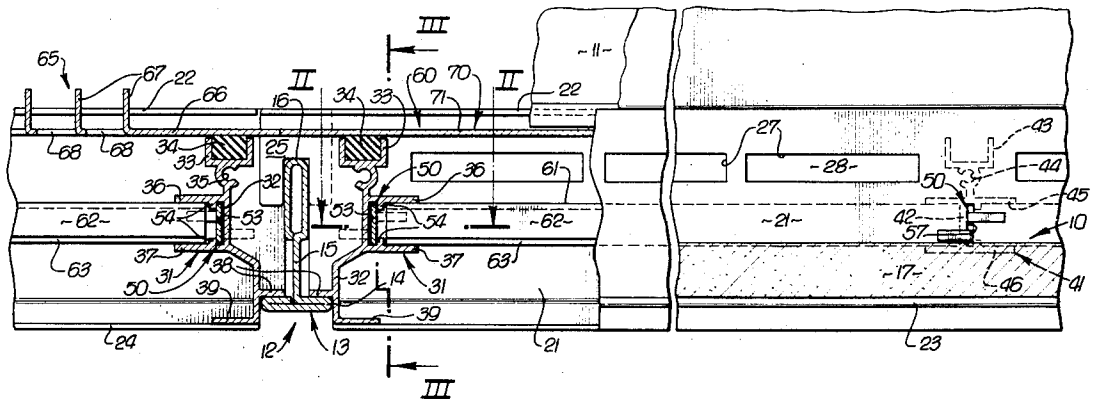


FIG. 1.

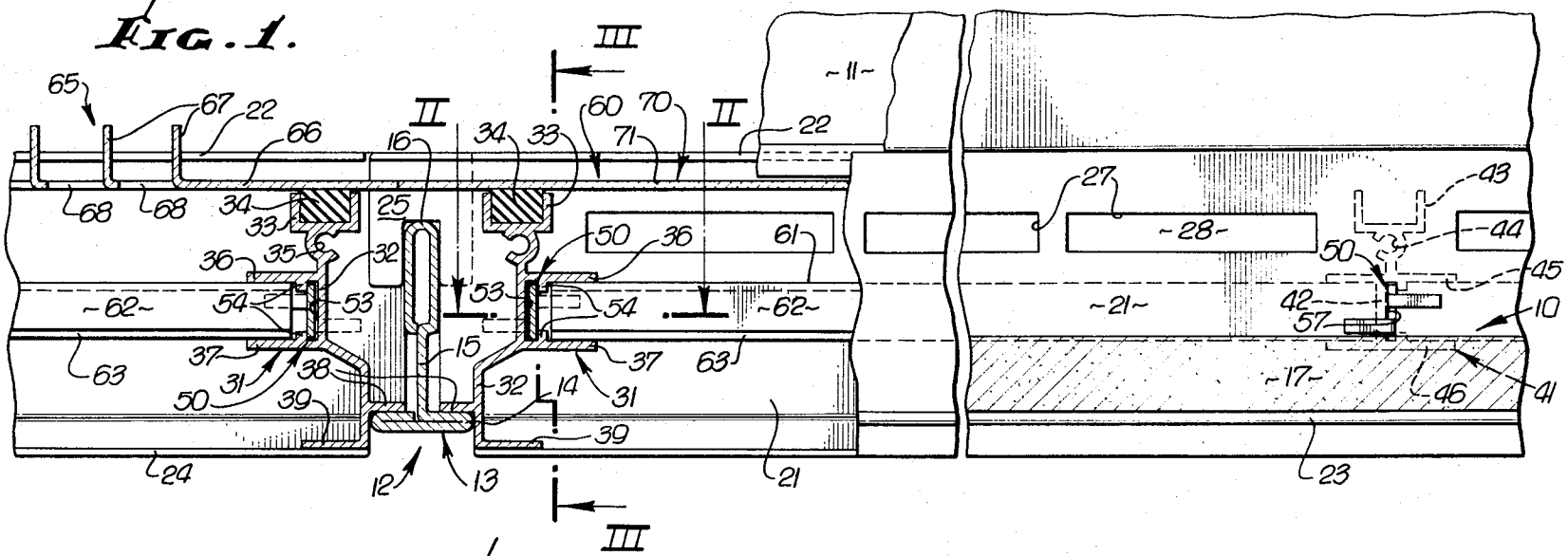


FIG. 2.

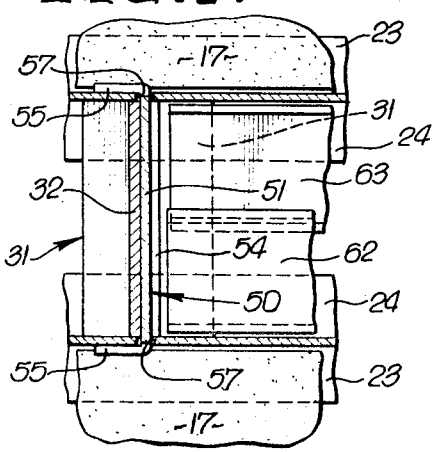


FIG. 3.

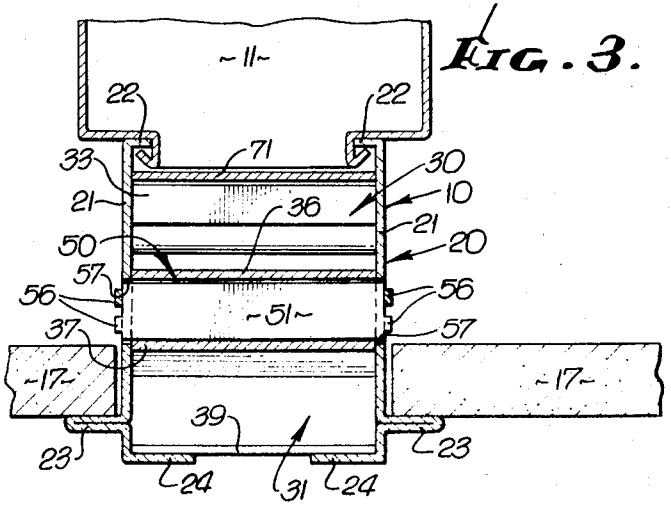
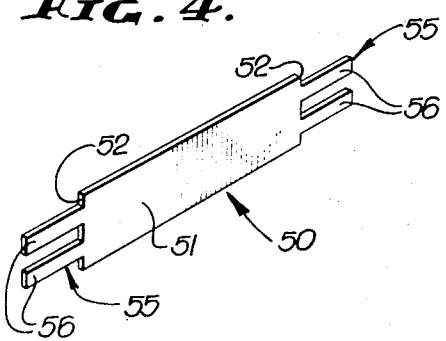


FIG. 4.



FIRE RESISTANT AIR BAR FOR USE IN A SUSPENDED CEILING STRUCTURE

BACKGROUND OF THE INVENTION

This invention relates to the field of ventilation and more particularly to a fire resistant air bar for use in a fire resistant suspended ceiling.

Modernly, the rooms of buildings and other structures are provided with a decorative and aesthetically pleasing suspended ceiling located below the real ceiling of the room. Such suspended ceilings, usually include a framework of main runners and cross runners on which are supported ceiling tiles to separate an attic space from the room below. In this attic space, typically is located the air conditioning equipment such as air plenum chambers, ducts, etc., for supplying conditioned air to and for returning air from the room below. In order for the air to pass from the attic space to the room below, air bars are located in the framework of the suspended ceiling.

Typically, an air bar has a pair of side rails spaced apart by spacers and has air control means, such as nested weirs, located therebetween so that the air will controllably flow through an air bar to pass through the suspended ceiling. The side rails of the air bar additionally support the adjacent ceiling tiles of the suspended ceiling to be an integral part of the suspended ceiling framework.

In many of the buildings, the suspended ceilings are designed to be a fire barricade. Such suspended ceilings have main runners and cross runners made of a high melting point material and have fire resistant ceiling tiles. However, it is not easy to make the air bars of the suspended ceiling framework out of the high melting point material because of the compliancy of shapes of some of the parts thereof. The side rails and the nested weirs have relatively simple shapes and so can be formed of the high melting point material. However, the spacers which separate both the side rails and mount the nested weirs, have complicated shapes, therefore, the spacers were typically extruded into their complicated shape. The high melting point material cannot be readily and inexpensively extruded in the complicated spacer shapes and so the spacers heretofore have been extruded from lower melting point material.

If an air bar, having side rails and nested weirs made of high melting point material, were assembled with extruded spacers made of a low melting point material, and were included in a fire resistant ceiling, the effectiveness of the ceiling as a fire blockade would be reduced. In case of a fire, the spacers would soften and possibly melt to drop the nested weirs and to allow the side rails to pivot and drop the fire resistant ceiling tiles, leaving a hole in the suspended ceiling through which the fire could spread. What is needed then is an air bar which will maintain its spacing even though the spacers soften or melt entirely.

BRIEF DESCRIPTION OF THE INVENTION

Therefore, it is the primary object of this invention to provide a novel fire resistant air bar for use in a fire resistant suspended ceiling.

Other and additional objects of this invention are to provide such an air bar in which high temperature side rails are maintained with the proper spacing when subjected to high temperatures to hold fire resistant ceiling tiles, to provide such an air bar in which high temperature spacing means are provided for spacing the side rails; to provide such an air bar in which the spacing means supports the spacers, to provide such an air bar with spacers having cavities to receive the high temperature spacing means therein, and to provide such an air bar which is inexpensive to manufacture, easy to assemble, and effective to maintain the location of fire resistant ceiling tiles to block the spreading of fire through the ceiling.

Generally stated, the fire resistant air bar for use in a suspended ceiling framework for mounting fire resistant ceiling framework for mounting fire resistant ceiling tiles and for mounting an air plenum chamber with an outlet which directs conditioned air through the air bar and into the room below, includes a pair of high temperature resistant side rails with flanges for receiving the ceiling tiles, and a pair of lower temperature melting spacers located between the side rails for spacing the side rails to permit the flow of air therebetween, with the improvement, according to this invention, including the provision of high temperature resistant spacing means positioned between the side rails for maintaining the spacing of the side rails during high temperatures after the spacers have weakened to enable the side rails to continue supporting the fire resistant ceiling tiles. The spacing means may be spacer bars made of a high melting point material and with end tabs for extending through slots in the side rails for fastening the two together. The spacers may have cavities in which the spacer bars are received to locate the spacers between the side rails for supporting nested weirs between the side rails.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, side-elevational view, partially in section of the fire resistant air bar, according to this invention, mounted in a fire resistant suspended ceiling;

FIG. 2 is a fragmentary, top-cross-sectional view taken along the plane II—II of FIG. 1;

FIG. 3 is a fragmentary, end-cross-sectional view taken along the plane III—III of FIG. 1;

FIG. 4 is a perspective view of a spacer bar for use in the fire resistant air bar, according to this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and particularly to FIGS. 1 and 3, the fire resistant air bar is generally denoted by the number **10**. The fire resistant air bar **10** is for mounting an air plenum chamber **11** thereon and for mounting in a fire resistant suspended ceiling **12** so that conditioned air from the air plenum chamber **11** can pass through the suspended ceiling **12** to be diffused throughout a room therebelow. Because it is fire resistant, the suspended ceiling **12** is constructed of main and cross runners **13** which have been folded of heavy gauge sheet metal. Each runner **13** has opposed lower flanges **14**, from which a vertical web **15** rises to terminate at a head ridge **16**. The runners **13** divide the ceiling space into generally rectangular shapes in which are located fire resistant ceiling tiles **17** extending between and resting on the flanges **14**.

The use of heavy gauge sheet metal runners **13** and fire resistant ceiling tiles **17** provides a barrier to the spreading of a fire from the room below to the attic space above the suspended ceiling **12**. This barrier has heretofore been broken by the use of prior art air bars in the suspended ceiling **12**. Such prior art bars melt, upon being subjected to high temperatures, to fall themselves or to drop the ceiling tiles **17** supported thereby. The falling of the air bars or the ceiling tiles **17** would cause an opening through the suspended ceiling barrier through which the fire could spread. The fire resistant air bar **10**, according to this invention is so constructed that when the bar **10** is subjected to the high temperatures of a fire, the bar **10** will continue to act as an integral part of the ceiling **12** to maintain the ceiling **12** as a fire barrier.

Generally stated, the fire resistant air bar **10** includes high temperature resistant side rails **20** having flanges **23** for receiving and supporting ceiling tiles **17**, lower temperature melting spacers **30**, either end spacers **31** or intermediate spacers **41**, located between the side rails **20** for spacing the side rails **20** to permit the flow of air therethrough, and high temperature resistant spacer means **50** such as spacer bars **51** positioned between the side rails **20** for maintaining the spacing of the side rails **20** during high temperatures after the spacers **30** have weakened to enable the side rails **20** to continue supporting the fire resistant ceiling tiles **17**. The air bar is completed by air control means **60** such as nested weir means **61**, extractors **65** and blank offs **70**.

Referring now primarily to FIG. **3** the side rails **20** of the air bar **10** are formed of heavy gauge sheet metal such as steel, or other suitable metal with a high melting temperature. The side rails **20**, each have side walls **21** with an upper inwardly extending lip **22** for mounting the air plenum chamber **11**. A reverse bend is formed in the central portion of the side wall **21** to provide a central outwardly extending flange **23** for receiving and supporting the adjacent edges of the ceiling tiles **17**. The lower edge of the side wall **21** is bent inwardly to provide a lower inwardly extending flange **24** for diffusing the air that passes through the air bar **10**. The ends of the side walls **21** have hooks **25** formed therein adjacent the upper edge thereof for hooking over the head ridges **16** of adjacent means runners **13** for mounting the air bar **10** in the suspended ceiling **12**. Selected side walls **21** will have slots **27** formed therein which are closed by knock out plates **28** which will, when opened, provide an air return through the suspended ceiling **12**. The side rails **20** are not completely ready to be spaced by the spacers **30**.

The spacers **30** are for spacing the side rails **20** to permit the flow of air therethrough and for mounting the air control means **60**. Because of the complicated shape of the spacers **30**, they cannot be inexpensively made of heavy gauge sheet metal which has a high melting point but have been extruded of a metal such as aluminum. Such metals along with being extrudable, also have a low melting temperature. Therefore, the spacers **30** can only be depended upon to space the side rails **20** during normal room temperatures.

The spacers, illustratively shown are of two types, end spacers **31** and intermediate spacers **41**. As best seen in FIG. **1**, each end spacer **31** has a vertical web **32** with an inverted channel **33** formed in the upper end thereof for receiving a block **34** of rubber or other sealing material. Below the channel **33**, the web **32** defines an open sided circular cavity **35** for receiving sheet metal screws. Vertically spaced upper and lower flanges **36** and **37** extend inwardly from the web **32** directly below the cavity **35**. Below the lower flange **36**, the web **32** is bent outwardly before returning to the vertical to have a foot flange **38** extend outwardly therefrom for resting o the flanges **14** of an adjacent runner **13**. The lower edge of the web **32** is folded inwardly to provide a lowermost flange **39** which will engage the upper side of the lower inwardly extending flange **24** of the side rails **20** to provide stiffening thereto.

The intermediate spacer **41** is shown in hidden lines in FIG. **1** and has a web **42**. The web **42** has on the upper edge thereof an inverted channel **43** again with a block **34** located therein. Below the channel **43**, the web **42** defines an open sided circular cavity **44** for receiving sheet metal screws. Oppositely extending vertically spaced upper and lower flanges **45** and **46** are formed in the web **42** below the cavity **44** to complete the intermediate spacer **41**, ready to be mounted between the side rails **20** by the spacer means **50**.

The spacer means **50** are high temperature resistant and are for positioning between the side rails for maintaining the spacing of the side rails during high temperatures after the spacers **30** have weakened. As best seen in FIG. **4**, the illustrated spacer means **50** are spacer bars **51** of generally rectangular shape. Each spacer bar **51** is formed out of a suitable high temperature melting material such as steel or other suitable metal. Each spacer bar **51** has end surfaces **52** which are spaced equal to the spacing of the inside surfaces of the side rails **20**. Each spacer bar **51** is for location in a cavity **53** in a respective spacer **31** or **41**, which is defined between the upper and lower flanges **36** and **37** or **45** and **46** by opposed ridges **54** provided therein. The spacer bars **51**, so located, support the spacers **41** and **31** and are ready to be secured to the side rails **20** by fastening means **55**.

The fastening means **55** are for fastening the bars **51** to and between the side rails **20**. In the illustrated embodiment, the fastening means **55** includes the provision of parallel tabs **56** extending outwardly from the end surfaces **52** of each spacer bar **51**. The fastening means **55** also includes the provision of matingly, vertically spaced slots **57** in the side rails **20** at the location of the spacer bars **51**. As best seen in FIG. **2**, the tabs **56** extend through the slots **57** to be bent over the side rails **20** to thereby mount the spacers **31** and **41** between the side rails **20** for receiving the air control means **60**.

The air control means **60** are provided between the side rails **20** for regulating the flow of conditioned air between the side rails. The illustrated air control means **60** are nested weir means **61**, extractors **65**, and blank offs **70**. The nested weir means **60** were first disclosed in my U.S. Pat. No. 3,411,425 as including an upper channel member **62** inverted and inserted into a lower channel member **63**. The channel members **62** and **63**, thus nested, are inserted between the upper and lower flanges **36** and **37**, of the end spacers **31** and between the upper and lower flanges **45** and **46** of the inter-

mediate spacers **41** to extend therebetween. The channel members **62** and **63** may be extended or contracted to regulate the flow of conditioned air between the side rails **20**.

The extractors **65** are for extracting a measured amount of air from the air plenum chamber **11** and directing it down between the side rails **20**. As best seen in the left side of FIG. **1**, the extractors **65** are plates **66** with vanes **67** upstanding therefrom leaving holes **68**. The plates **66** as best seen in FIG. **3**, slid under the lips **22** of the side rails **20** on the blocks **34** to seal thereagainst. The vanes **67** deflect the air in the plenum chamber **11** down through the holes **68** between the side rails **20** to be diffused by the lower flanges **24** thereof.

When air passage from the air plenum chamber **11** between the side rails **20** is not desired, blank-offs **70** are provided for preventing such air flow. The blank-offs **70** are plates **71** again slid under the lips **22** of the side rails **20** on the rubber blocks **34** to be sealed thereby. Usually where blank offs **70** are provided, the knock out plates **27** are removed to permit the return of air from the room through the suspended ceiling **12** into the attic space thereabove.

It is contemplated that the fire resistant air bar **10** will be sold and installed in the fire resistant suspended ceiling **12** as a unit. The unit is assembled by inserting the spacer bars **51** into the cavities **53** in the spacers **31**, **34**. The channel members **62** and **63** are nested and inserted in between the flanges **36**, **37**, and **46**, **45**. The blocks **34** are inserted in the channels **33** and **24** or the spacers **31**, **41** and extractors **65** and/or blank offs may be positioned thereon. The side rails **20** are slid onto the tabs **56** of the spacer bars **51** and the spacer bars **51** bent over to secure the air bar together ready to be hung in a suspended ceiling **12**. Sheet metal screws may be pushed through the side rails **20** to be turned into the cavities **35**,**44** to additionally secure the side rails **20** to the end spacers **31** and intermediate spacers **41**.

The air bar **10** is hung by hooks **25** over the main runners **13** to be centrally located between an adjacent pair of cross runners **13**. An air plenum chamber is mounted to the air bar by inserting the outlet walls thereof between the lips **22** of the side rails **20**. Ceiling tiles **17** are inserted between the flanges to extend between the cross runners **13** and the air bar **11** to be supported thereby, to complete the fire resistant ceiling **11**.

In the event of a fire in the room below the fire resistant suspended ceiling **12**, the heat produced by the fire may be sufficient to weaken or melt the spacer **31** and **41** to drop the nested channel members **62** and **63**, the extractors **65**, and blank offs **70** onto the flanges **24** of the air bar **10** to close the space between the side rails **20** thereof. Yet the melting of the spacers **31** and **41** will not allow the side rails **20** to pivot and drop the ceiling tile **17** because the spacer bars **51** will maintain the spacing of the side rails **20** to enable the side rails **20** of the fire resistant air bar **10** to continue supporting the fire resistant ceiling tile **17**. The fire resistant ceiling tile **17** in the suspended ceiling **12** will help to confine the fire therebelow and will help prevent the spreading of the fire to the attic space above the suspended ceiling.

I claim:

1. A fire resistant air bar for use in a suspended ceiling framework for mounting fire resistant ceiling tiles and for mounting an air plenum chamber with an outlet which directs conditioned air through the air bar and into the room below, said air bar having a pair of high temperature resistant side rails with flanges for receiving the ceiling tiles, and a pair of lower temperature-melting spacers located between the side rails for spacing the side rails to permit the flow of air therebetween, the improvement comprising the provision of:

high temperature resistant spacing means positioned between the side rails for maintaining the spacing of the side rails during high temperatures after the spacers have weakened to enable the side rails to continue supporting the fire resistant ceiling tiles.

2. The invention as in claim **1** wherein the high temperature resistant spacing means includes at least a pair of spacer bars made of a material having a high melting point, said bars having end surfaces spaced correspondingly to the spacing between the inner surfaces of the side rails to be located therebetween.

3. The invention as in claim **2** wherein fastening means is provided for fastening the bars to and between the side rails.

4. The invention as in claim **3** wherein the fastening means includes the provision of tabs protruding from the end surfaces of the bars and the provision of slots in the side rails, said slots receiving said tabs to fasten the bars between the side rails.

5. The invention as in claim **2** wherein the spacers are provided with suitable shaped cavities for receiving the spacer bars therein, said spacer bars being located in the cavities to be joined to the spacers.

6. The invention as in claim **1** wherein air control means is provided between the side rails for regulating the flow of conditioned air therebetween, wherein the spacers are formed to receive and mount the air control means and wherein said spacing means mounts the spacers between the side rails.

7. The invention as in claim **6** wherein the spacing means includes a pair of spacer bars, and means for fastening the spacer bars to the side rails, and wherein the spacers includes a web and means for mounting the web to the spacer bars.

8. The invention as in claim **7** wherein the means for fastening includes the provision of end tabs on the bars and slots in the side rails for receiving the end tabs to mount the spacing bars.

9. The invention as in claim **7** wherein the mounting means includes the provision of a spacing bar receiving cavity in each web, said spacer bar being positioned in the cavity to mount the web thereto.

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