United States Patent [19]

Stults

[11] 3,872,927

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[54] FOAM RESTRAINING BARRIER

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[52] **U.S. Cl.** **169/48,** 160/6

[51] **Int. Cl.** **E05f 15/20**

[58] **Field of Search** 169/48, 49; 160/6

[56] **References Cited**

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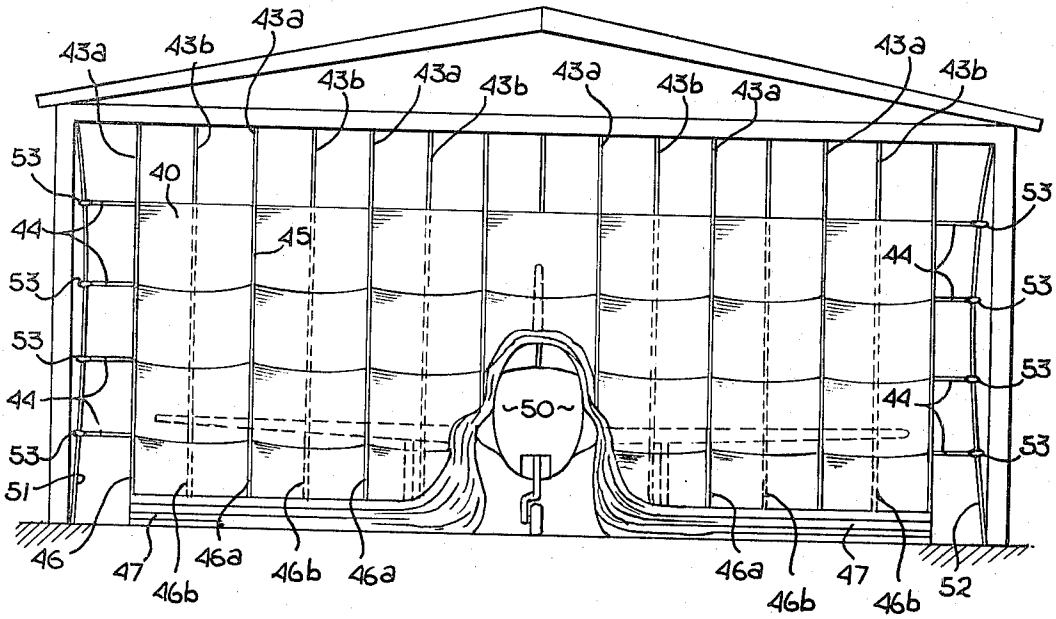
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[57] **ABSTRACT**

A porous barrier circumscribes a defined volume within which the high expansion foam fire extinguishing system is disposed. A barrier fabricated of porous, non-combustible members are interleaved and draped to enclose the interior of a warehouse or other large open structure to permit the effective activation of a high expansion foam fire extinguishing system. The porous barrier is adapted to substantially negate wind loads created by the disposition of high expansion foam while containing the body of foam in a manner which is sufficient to extinguish a fire which has occurred within the area surrounded by the barrier.

12 Claims, 6 Drawing Figures



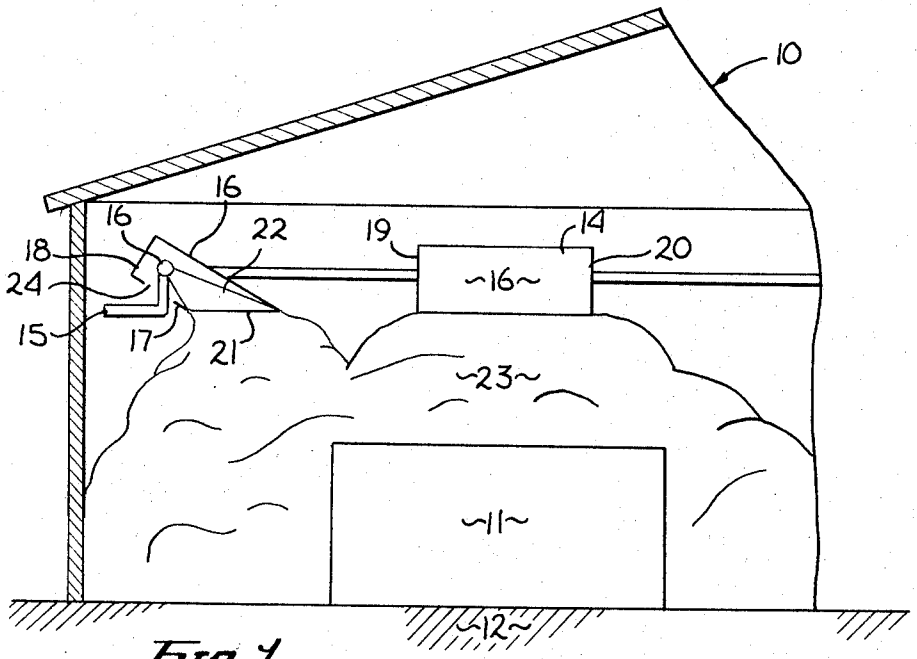


Fig. 1

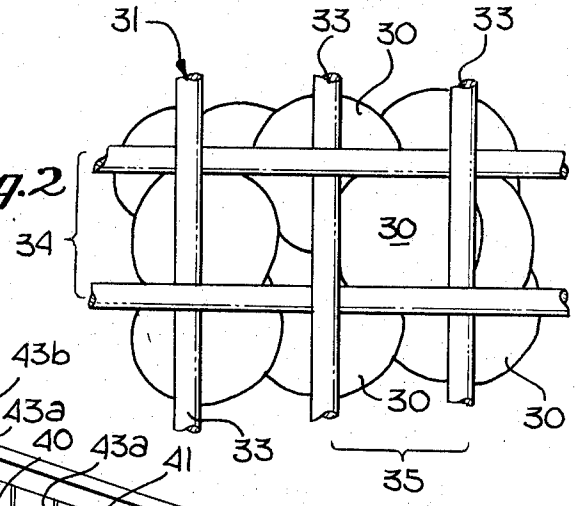


Fig. 2

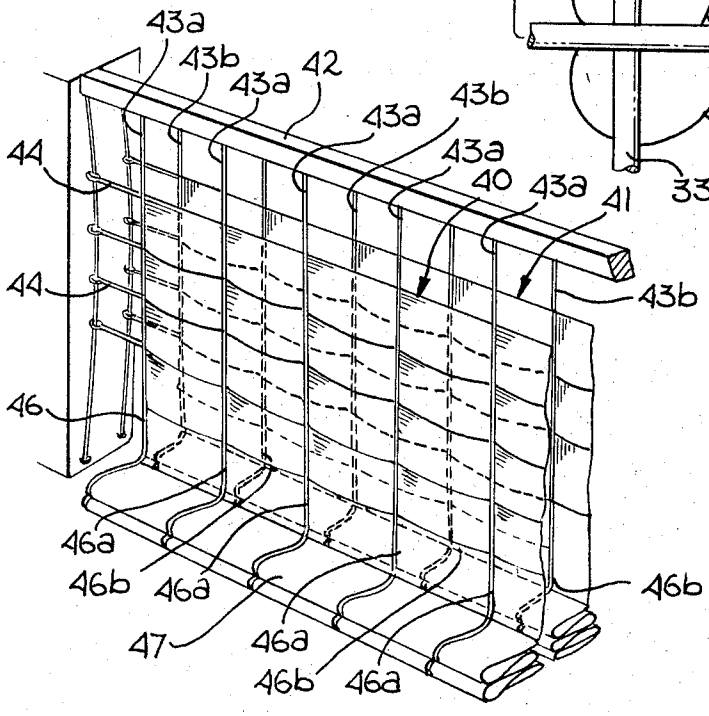


Fig. 3

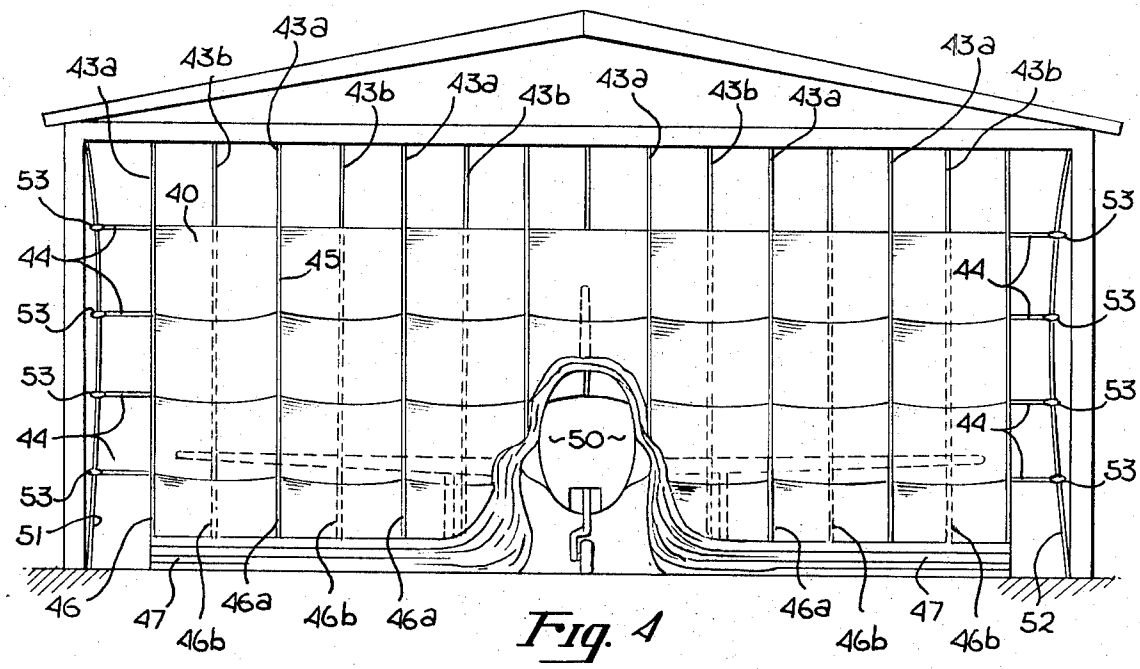


Fig. 4

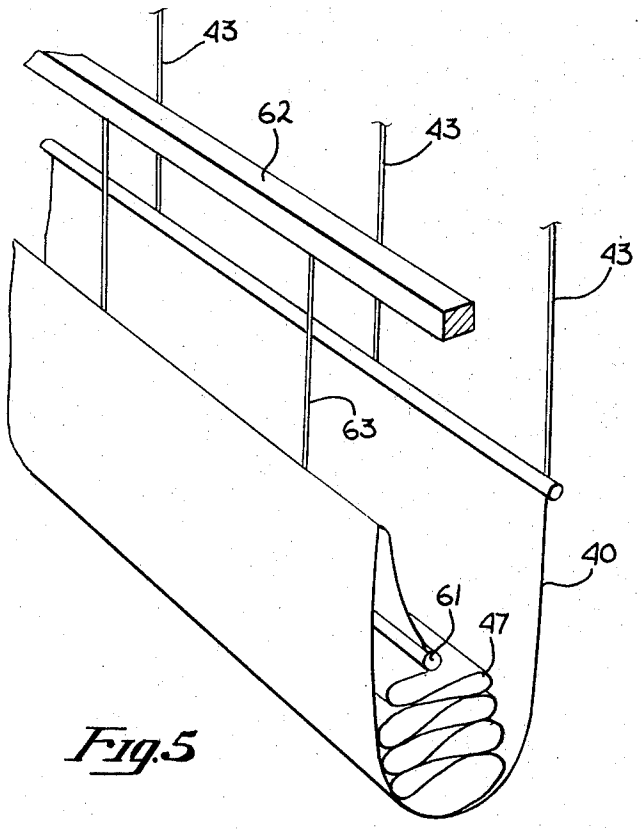


Fig. 5

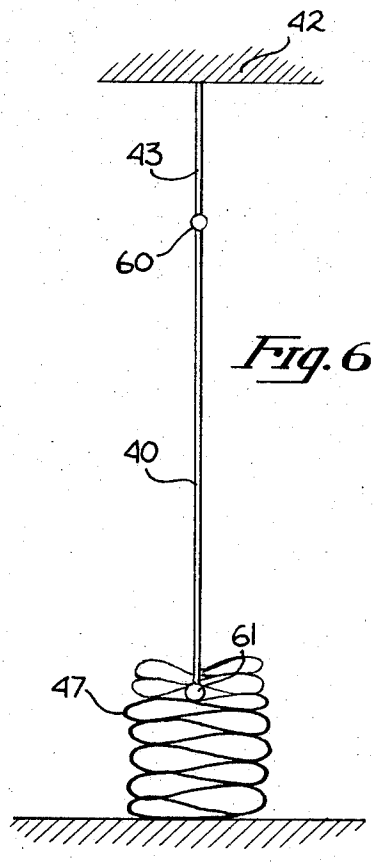


Fig. 6

FOAM RESTRAINING BARRIER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to high expansion foam fire extinguishing systems and, more particularly, to associated apparatus utilized to confine high expansion foam within open structures.

2. Prior Art

The prior art discloses many devices which are generally catagorized as high expansion foam fire extinguishing systems. Typical of those foam fire extinguishing systems which the present invention is adapted to be used in conjunction with are described in Applicant's U.S. Pat. Nos. 3,592,269, **3,709,302** and 3,750,754. The foam fire extinguishing systems disclosed in the patents issued to Applicant typically utilize a pre-mixed solution of water and high expansion foam concentrate. Upon the detection of the presence of a fire, the solution of high expansion foam concentrate is subjected to pressure which forces the mixture into a manifold having a plurality of nozzles. The mixture emitted from the nozzles is within a foam generator which includes a foam generating screen disposed opposite the nozzles, the generator defining an open orifice through which air is drawn. The foam is formed by a combination of air and high expansion foam concentrate striking the screen element of the generator. Although the scope of the present invention is broad enough to permit its use with substantially all types of high and low expansion foam generators used for fire extinguishing systems, the present invention is preferably used with those systems defined in Applicant's patents listed hereinabove.

One of the problems inherent in foam fire extinguishing systems is the inability to isolate the foam to the particular area which may be involved in fires. Where a foam fire extinguishing system is incorporated into a structure having a limited area, the problem of dissipation of the foam is minimized. Since most foam fire extinguishing systems can only produce a limited amount of foam, the concentration of the generated foam becomes a critical factor.

The present invention barrier adapts the use of foam fire extinguishing systems to structures having large interior open areas which have heretofore been able to utilize the advantages of foam fire extinguishing systems. As an example, warehouses or large airplane hangers typically enclose vast open spaces containing goods or airplanes which are clearly more valuable than the building itself. As stated, one of the problems inherent in foam fire extinguishing systems is the inability to isolate the generated foam to the area to be protected. One of the methods used by the prior art to isolate generated foam within defined areas is the use of doors or other rigid structural elements incorporated within the building. Upon the detection and activation of the fire extinguishing equipment, the doors or other like rigid structures are dropped from the ceiling to thereby isolate the generated foam. The problems inherent in this type of structures are obvious. The use of doors or other rigid elements generally preclude the rapid positioning of the members thereby essentially precluding the ability to isolate the generated foam. In addition, use of rigid structures precludes full use of the available floor space since no goods, air frames, etc., can be located beneath the elements being lowered. Another problem inherent in this method is that a rigid

structure would essentially rpeclude firemen or other person working within the building to move freely from one section of the building to another.

Other problems which exist in the structures defined by the prior art deal with the unreasonable structural loads which would be imposed upon the building. If a building is retrofit with doors or other rigid foam enclosing elements, the weight of the element itself can impose an unreasonable structural load upon the building. In addition, the generation of foam can create what is in effect a wind load upon the door or rigid barrier and this in turn will impose heavy loads on the structure of the building. It is clear that these problems create a danger to firemen or other persons in the building during operation of the foam generating equipment.

The present invention substantially resolves the problems which exist in those structures disclosed by the prior art. The present invention barrier utilizes a fiberglass or other non-combustible barrier which is put into place upon the detection of a fire. The non-combustible barrier is porous and is disposed in interleaved sections which permits the inclusion of uniform seams or other openings permitting firemen or other persons to move through the barrier. The barrier has porous openings which are small enough to preclude the loss of generated foam therethrough. In addition, the present invention barrier prevents the build-up of pressure on the barrier itself and on the building as a result of the created wind load arising from the generated foam. The present invention barrier is flexible so that it will drape around any object disposed beneath the barrier and on the floor of the protected buidling and still enclose any foam which is generated therein.

SUMMARY OF THE INVENTION

The present invention comprises a flexible barrier to be used as dividers within the buildings having large open spaces which are protected from fire by foam fire extinguishing systems. The present invention barrier is typically to be used with foam fire extinguishing systems such as those described in Applicatnt's U.S. Pat. Nos. 3,592,269, 3,709,302 and 3,750,754. The present invention barrier is fabricated of a fiberglass scrim or other porous, non-combustible material. The barrier is a pair of interleaved members which are dropped from a level above the area to be protected upon the detection of the fire and activation of the fire extinguishing system. The barriers are weighted and are adapted to drape around any object which may be disposed on the floor surface beneath the barrier thereby maintaining the integrity of the barrier to the foam being generated. Each interleaved barrier comprises a number of panels having seams which are separated at uniform intervals, the seams permitting access by firemen or other persons working within the involved structure. The porous nature of the barrier precludes the build-up of a wind load yet retains the foam within the defined area. To provide stability to the structure, horizontal and vertical supports couple the surface of the barrier to the walls, ceiling or other stable portions of the structure being protected. The barrier, after activation, provides a porous structure which can retain the volvume of a foam being generated even where structures, such as an airplane, may be disposed below the barrier.

It is therefore an object of the present invention to provide an improved foam fire extinguishing system to

be used in structures having large unobstructed interior volumes.

It is another object of the present invention to provide an improved barrier for retaining the foam generated by foam fire extinguishing systems.

It is still another object of the present invention to provide an enclosing barrier for a foam fire extinguishing system which can be quickly and easily put in place upon the detection of a fire.

It is still yet another object of the present invention to provide an enclosing barrier for a foam fire extinguishing system which is inexpensive and simple to fabricate.

The novel features which ae belived to be characteristic of the invention, both as to its organization and method of operation, together with further objectives and advantages thereof, will be better understood from the following description considered in connection with the accompanying drawing in which a presently preferred embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawing is for the purpose of illustration and description only and is not intended as a definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a side elevation view of an interior volume of an open structure illustrating a foam fire extinguishing system to be used with the present invention.

FIG. **2** is an enlarged, schematic view of a barrier element constructed in accordance with the present invention.

FIG. **3** is a perspective view of a barrier mounted in accordance with the present invention.

FIG. **4** is a side elevation view illustrating the present invention barrier draped about an object disposed along the plane of the present invention barrier.

FIG. **6** is a side elevation, schematic view of the present invention barrier disposed in the dropped position.

DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENT

An understanding of a foam fire extinguishing system usable with the present invention can be best gained by reference to FIG. **1.** Structure **10** represents those classes of structures which include large interior open spaces such as warehouses and airplane hangars. As shown in FIG. **1,** object **11** represents goods or other like articles which are stored or otherwise within structure **10,** in this case, object **11** being disposed upon floor surface **12.** Foam generators **13** and **14** are disposed about the walls and upper elevations of structure **10** to be in position for the generation of foam upon the detection of a fire.

The present invention is usable with substantially all types of foam generating systems and in particular to those foam fire extinguishing systems described in Applicant's U.S. Pat. Nos. 3,592,269, 3,709,302 and 3,750,754. For the purpose of example only, this discussion assumes that foam generators **13** and **14** are the same as those described in Applicant's U.s. Pat. No. 3,709,302. A premixed solution of high expansion foam concentrate and water is pressurized and is ready for activation upon the detection of a fire. When a fire is detected, the acqueous solution of high expansion foam concentrate is input a line **15** and passes through manifold **16** of each of the generators **13** and **14.** Each generator **13** and **14** as shown in FIG. **1** is constructed of a top wall **16,** bottom wall **17,** rear wall **18** and a pair of side walls **19** and **20** as well as the generating screen **21.** The form of the generators designated by reference numerals **13** and **14** utilize a generating screen **21** which is parallel to floor surface **12,** but as explained this form of the high expansion foam fire extinguishing generator is for the purpose of example only.

A conical output **22** of foam concentrate and air contact screen **21** with the resulting generation of large quantities of foam **22.** In the form of the generators disclosed in Applicant's U.S. Pat. described hereinabove, no auxiliary source of air is required, air being drawn through orifice **24** by the partial vacuum created by the conical output **22** of foam concentrate. Each of the generators **13** and **14** shown in FIG. **1** have a plurality of output nozzles. As an example, where generators **13** and **14** utilize a set of eleven foam emitting nozzles, 1,500 standard cubic feet per minute of foam can be generated utilizing a solution delivery rate of 19 gallons per minute at a pressure of 35 psi. The foam **23** which is generated by exemplary generators **13** and **14** is sufficient to smother a fire which may have involved object **11.**

As stated previously, an object of the present invention is to provide a usable medium which will permit foam fire extinguishing systems to be utilized in structures which do not have sufficiently closed vertical barriers for containing foam **23.** In the example described in connection wth FIG. **1,** it can be seen that the quantity of foam **23** produced by generators **13** and **14** is maintained about the vicinity of object **11** only by the vertical confines of structure **10.** It can therefore be seen that a primary object of the present invention is to permit the confinement of the quantities **23** of foam even where permanent vertical walls of a structure are not sufficiently close to the objects being protected to permit concentration of the foam and thereby facilitate extinguishing the fire.

As stated previously, the structures utilized by prior art systems to confine foam generated by a foam fire extinguishing system were insufficient to meet the objectives of the present invention. The structures generally included doors or other rigid elements which could not be lowered sufficiently fast to confine the foam. The non-porous nature of the barriers put large structural stresses on the building from the created wind load, and the rigid barriers could not be used where an object was placed on the floor surface under the confining barrier. An understanding of the manner in which the present invention barrier resolves these problems can be best seen by reference to FIG. **2** wherein an enlarged view of a barrier made in accordance with the present invention is shown. FIG. **2** pictorially illustrates the bubbles **30** which make up the quantity of foam **23** shown in FIG. **1.** The generation of the foam creates a wind load which would naturally create large structural stresses on a non-porous barrier. The present invention barrier utilizes a scrim **31** which is fabricated from a meshed, non-combustible material. Since one of the objects of the present invention is to provide a barrier which will drape around an object, weight is a material consideration. Although the scope of the present invention is broad enough to encompass the use of a number of materials, the preferred embodiments of the present invention utilizes a scrim **31** fabri-

cated from fiberglass and coated with a conventional non-combustible coating.

In order to meet the objectives of the present invention, scrim **31** comprises a close knit mesh of horizontal and vertical filaments **32** and **33** respectively. Scrim **31** must be porous enough to dissipate the created wind load yet maintain the integrity of the quantity of foam generated. Utilizing a glass cloth scrim **31** fabricated from filaments **32** and **33** having a diameter of approximately 0.05 inches, the center to center interval **34** and **35** between adjacent filaments **32** and **33** respectively should be approximately 0.25 inches. To compromise the objectives set for the present invention, i.e., elimination of structural loads on the building and the ability to retain the created bubbles **30** within the confined area, the center to center intervals **34** and **35** can generally be within a ragne of 0.2 to 0.4 inches.

An understanding of the use of the present invention barrier can be best gained by reference to FIG. **3** wherein an isometric view of the present invention barrier in the activated position is shown. The total barrier used to contain generated foam comprises first and second panels **40** and **41** respectively. Each panel **40** and **41** is fabricated of the porous, non-combustible scrim shown in FIG. **2.** Each panel **40** and **41** depends from upper support **42.** Upper support **42** need not be disposed at the top of the structure being protected, but need only be high enough to insure that the foam which is contained by the present invention barrier will reach a height which is higher than the objects which are being protected. A plurality of chains **43***a* and **43***b* or other non-combustible lines support panels **40** and **41** respectively. Each panel **40** and **41** is strengthened by horizontal and vertical stiffening members **44** and **45** respectively which can be fabricatd of any suitable non-combustible batten, chain or like member. As stated previously, one of the objects of the present invention is to provide a barrier which will insure that firemen or other personnel working in the involved structure can move through the barrier. To fulfill this objective, the bottom portion of panels **40** and **41** include open seams **46***a* and **46***b* respectively which are uniformly disposed along the panels **40** and **41** to provide for access by emergency personnel. A totally open seam would permit unwanted passage of the foam through panels **40** and **41** and therefore the seams **46***a* and **46***b* of panels **40** and **41** are interleaved to insure that the solid portion of one panel is aligned with a seam **46***a* or 46*b* of the other panel.

To provide an effective barrier which meets the stated objectives, the widths and height of panels **40** and **41** must contain a sufficient amount of material to permit draping of panels **40** and **41** about any object which may be disposed under panels **40** and **41.** As can be seen in FIG. **3,** the bottom portion **47***a* and **47***b* of panels **40** and **41** respectively fall in excess folds along the floor surface. The illustration shown in FIG. **3** presents no object which is under panels **40** and **41** and therefore the draped excess is merely piled along the floor surface. The required vertical draping will be discussed in detail hereinbelow.

Referring now to FIG. **4,** a side elevation view of the dropped panels **40** and **41** is shown requiring the draping about an object **50.** Support lines **43***a* and **43***b* secure the upper extremities of panels **40** and **41** to support **42.** As was shown in FIG. **3,** horizontal and vertical battens **44** and **45** respectively provide rigidity to panel **40.** The edges of panels **40** and **41** are slidably coupled to vertical supports **51** and **52** by slip rings **53.** Slip rings **53** insure that panel **40** can be raised and lowered while maintaining the proper orientation of panels **40** and **41.** The lower portions of panels **40** and **41** have open seams **46***a* and **46***b* to permit passage through the panels after they have been put in the lowered positions as shown in FIG. **3** and FIG. **4.** From FIG. **4** it is clear that panels **40** and **41** must be capable of draping around object **50** when it is in the lower position to restrain the outflow of the generated foam. The excess material **47** is loosly piled upon the surface of the floor **12** where it is not in contact with any object **50.** As shown in FIG. **4,** the excess material **47** permits panels **40** and **41** to drape around object **50** without the presence of any unreasonably large apertures or openings through which foam can escape. The height of the panel is contingent on the height of the structure being protected as well as the objects which may be positioned beneath the present invention barrier. The height should always be selected such that excess portion **47** is at least ten feet in excess of the vertical height of panels **40** and **41.**

The ability to store the present invention foam barrier and position same upon the detection of a fire can be best seen by reference to FIG. **5** and FIG. **6.** Vertical supports **43** suspend panel **40** (or **41**) from upper support **42.** When the present invention barrier is in the lowered position as shown in FIG. **6,** the upper terminus **60** of panel **40** uniformly distributes the suspension of panel **40** from the vertical supports **43.** In order to properly allow panel **40** to drop, a distributable load **61** is provided at the lower end of panel **40.** Although the scope of the present invention is broad enough to utilize most materials which exhibit the preferred characteristics, namely, liquids, the preferred embodiment of the present invention utilizes sand to implement load **61.** In this manner, a human being or object beneath panel **40** at the time it is activated will be contacted only by a member which has minimal resistance to a shearing force and therefore by an object which will produce less injury than would be produced by a rigid object. In addition, the use of sand **61** will permit panel **40** to form a good seal around whatever object was disposed beneath the panel prior to its being activated. Excess portion **47** of panel **40** will be disposed upon the floor surface **12** of the structure being protected, the excess portion **47** being weighted down by the distributed sand **61.**

In order to activate the present invention barrier, the upper portion of panel **40** can be used as a shroud and connected to a release apparatus **62** by a plurality of lines **63.** As an alternative form, a pivotable shelf or other like support can be used. The foam fire extinguishing system described in Applicant's U.S. Pat. No. 3,592,269 utilizes a conventional heat detector to sense the presence of a fire. When the sensor detects the presence of a fire, it energizes a relay pack which produces an electrical signal to the valve-pressure regulators of the foam fire extinguishing systems. In a like manner, release apparatus **62** can be suitably connected to the heat detection sensor utilized by the fire extinguishing system to release line **63** thereby permitting panel **40** (and **41**) to fall to the floor surface at a speed which is quick enough to insure that generated foam will not be dissipated throughout the opening stances of the building being protected. The scope of the present invention is broad enough to utilize any

conventional releasing apparatus which can be activated upon the detection of a fire, the specific choice being known to persons having skill in the art.

It can therefore be seen that the present invention provides means whereby foam fire extinguishing systems can be effectively utilized within structures having large interior volumes. Through the use of the porous barriers described hereinabove, the foam fire extinguishing systems can be employed within the confines of the barriers irrespective of the placement of airplanes, cargo or other stored objects. The use of the interleaved pair of non-combustible panels described insures that damage to objects within the building will be kept at a minimum and permit fire personnel and other persons to move through the building in order to put out the fire as soon as possible. By providing a light weight, easily positioned barrier circumscribing the foam generated by the fire extinguishing equipment, the protection of warehouses, airplane hangars and other like structures is facilitated without endangering the structural integrity of the building.

I claim:

1. A restraining barrier for use with foam fire extinguishing systems which include generators for producing a given volume of fire extinguishing foam, said barrier comprising:

a. a pair of porous, non-combustible panels adapted to be vertically positioned in parallel, spaced relation to one another, each of said panels including a plurality of vertical seams therein, the vertical seams of one of said panels being interleaved with the vertical seams of the second of said panels, the vertical height of said panels including a predetermined excess portion at the bottom thereof;

b. distributed load means for weighting said panels, said distributed load means being coupled to each of said panels intermediate said excess portion and the portion of said panels adapted to be vertically positioned;

c. a plurality of vertical battens uniformly disposed along each of said panels;

d. a plurality of horizontal battens uniformly disposed along each of said panels, the lowermost of said horizontal battens being adjacent the upper terminus of said vertical seams; and

e. release means for vertically positioning said panels upon the activation of the foam fire extinguishing system, said release means being coupled to said panels.

2. A restaining barrier as defined in claim **1** wherein said panels comprise a scrim having horizontal and vertical meshed filaments, said horizontal and vertical filaments having substantially uniform center to center intervals.

3. A restraining barrier as defined in claim **2** wherein the interval between adjacent pairs of horizontal and vertical filaments respectively is in the range of 0.2 to 0.4 inches.

4. A restraining barrier as defined in claim **2** wherein said scrim is fabricated of fiberglass.

5. A restraining barrier as defined in claim **1** wherein said distributed load means comprises sand horizontally and uniformly disposed along said panels.

6. A foam restraining barrier for use in the interior of structures protected by foam fire extinguishing systems which include generators to produce given volumes of fire extinguishing foam, said foam restraining barrier comprising:

a. a pair of porous, non-combustible panels adaped to be vertically positioned in parallel spaced relation to one another with the interior of the structure to provide a circumscribed area about the volume of foam, each of said panels including a plurality of vertical seams therein, the vertical seams of one of said panels being interleaved with the vertical seams in the second of said panels, the vertical height of said panels including a predetermined excess portion at the bottom of said panels, said panels being laterally suspended intermediate vertical supports defining the circumscribed area of the structure being protected by the foam fire extinguishing system;

b. distributed load means for weighting said panels, distributed load means being coupled to each of said panels intermediate said excess portion and the portion of said panel adapted to be vertically positioned;

c. a plurality of vertical battens uniformly disposed along each of said panels;

d. a plurality of horizontal battens uniformly disposed along each of said panels, the lowermost of said horizontal battens being adjacent said vertical seams, said horizontal battens being laterally extended from said panels and slidably coupled to said vertical supports; and

e. release means for vertically positioning said panels upon the activation of the foam fire extinguishing system, said release means being coupled to said panels.

7. A foam restraining barrier as defined in claim **6** wherein each of said panels comprises a scrim having horizontal and vertical meshed filaments, adjacent pairs of said horizontal and vertical meshed filaments respectively having substantialy uniform center to center intervals.

8. A foam restraining barrier as defined in claim **7** wherein the interval between adjacent pairs of horizontal and vertical filaments respectively is in the range of 0.2 to 0.4 inches.

9. A foam restraining barrier as defined in claim **7** wherein said scrim is fabricated from fiberglass.

10. A foam restraining barrier as defined in claim **6** wherein said distributed load means comprises sand horizontally and uniformly disposed along said panels.

11. A foam restraining barrier for use within the interior volume of structures protected by foam fire extinguishing systems which include foam generators which, upon activation, produce given volumes of fire extinguishing foam, said foam restraining barriers comprising:

a. a pair of non-combustible panels fabricated from a fiberglass scrim having horizontal and vertical meshed filaments, adjacent pairs of said horizontal and vertical meshed filaments respectively having substantially uniform center to center intervals, said panels being adapted to be vertically positioned in parallel spaced relation to one another and in contact with the floor of the structure being protected, each of said panels including a plurality of vertical seams therein, the vertical seams of one of said panels being interleaved with the vertical seams in the second of said panels, the vertical height of each of said panels including a predeter-

mined excess portion to be disposed along the floor of the structure;

b. sand weighted members uniformly disposed along and coupled to each of said panels adjacent said excess portions and adapted to contact the floor of the structure when said panels are vertically positioned;

c. a plurality of vertical battens uniformly disposed along each of said panels;

d. a plurality of horizontal battens uniformly disposed along each of said panels, the lowermost of said horizontal battens being adjacent said vertical seams, said horizontal battens being laterally extended from each of said panels and slidably coupled to said vertical supports; and

e. release means for vertically positioning said panels upon the activation of the foam fire extinguishing system, said release means being coupled to said panels.

12. A foam restraining barrier as defined in claim **11** wherein the interval between adjacent pairs of horizontal and vertical filaments respectively is in the range of 0.2 to 0.4 inches.

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