Dec. 3, 1963 A. M. KINNEY 3,112,535

EXPLOSION VENTING CONSTRUCTION FOR BUILDINGS

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Fig. 1

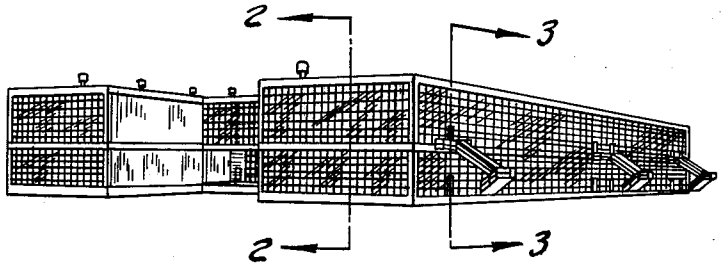


Fig. 10

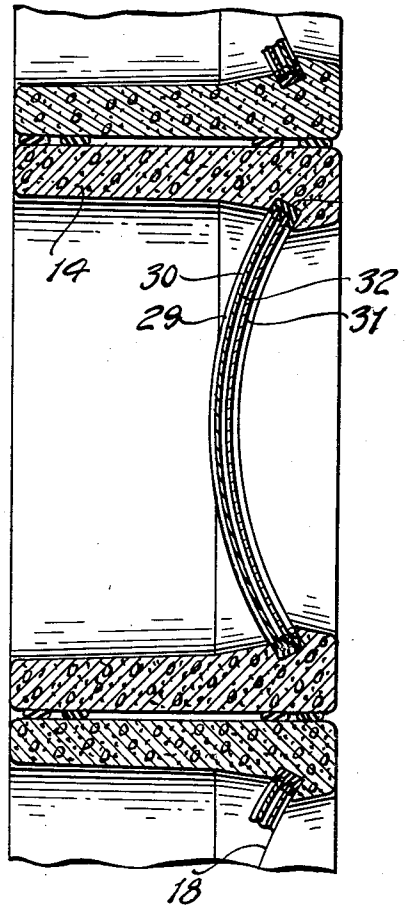
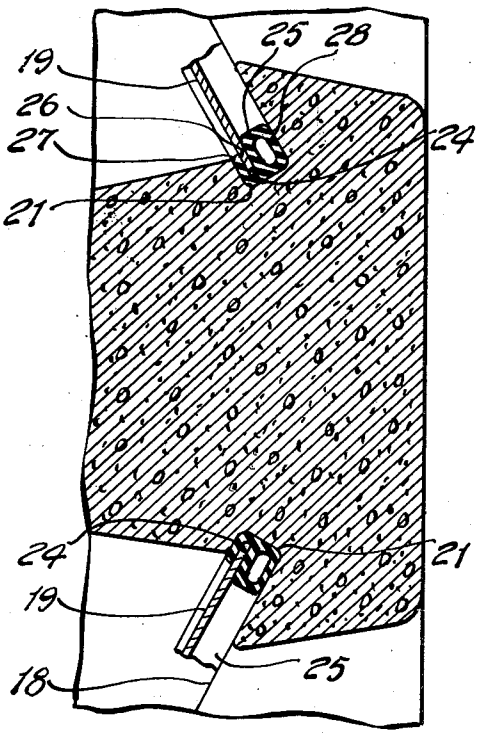


Fig. 9



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EXPLOSION VENTING CONSTRUCTION FOR BUILDINGS

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Fig. 2

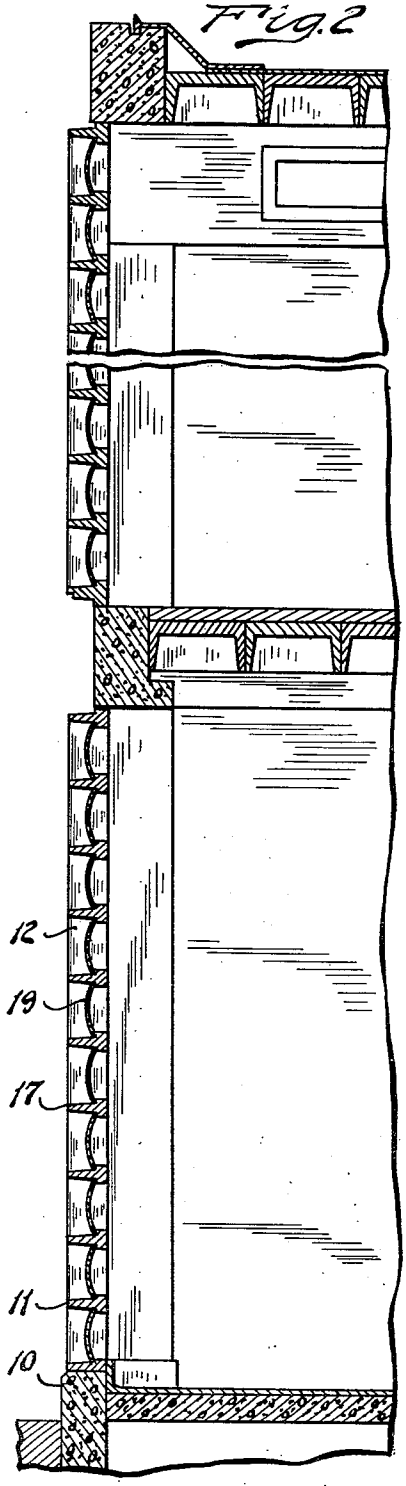
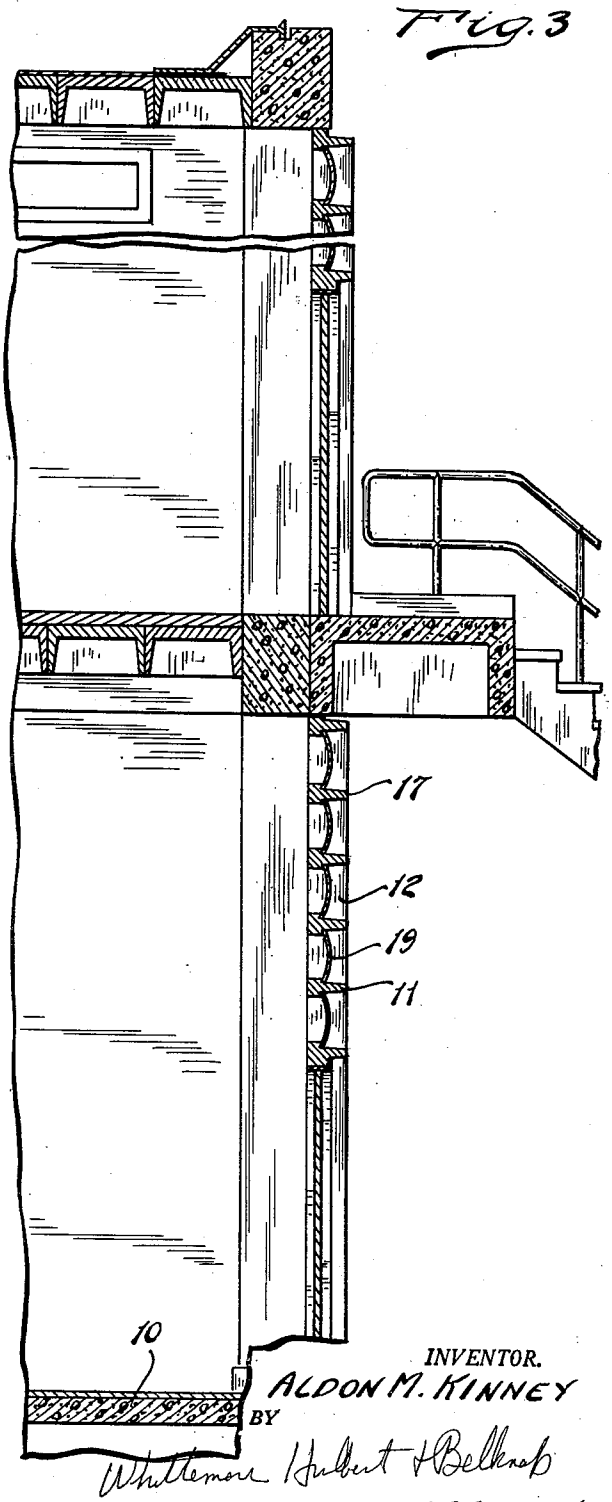


Fig. 3



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EXPLOSION VENTING CONSTRUCTION FOR BUILDINGS

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Fig. 4

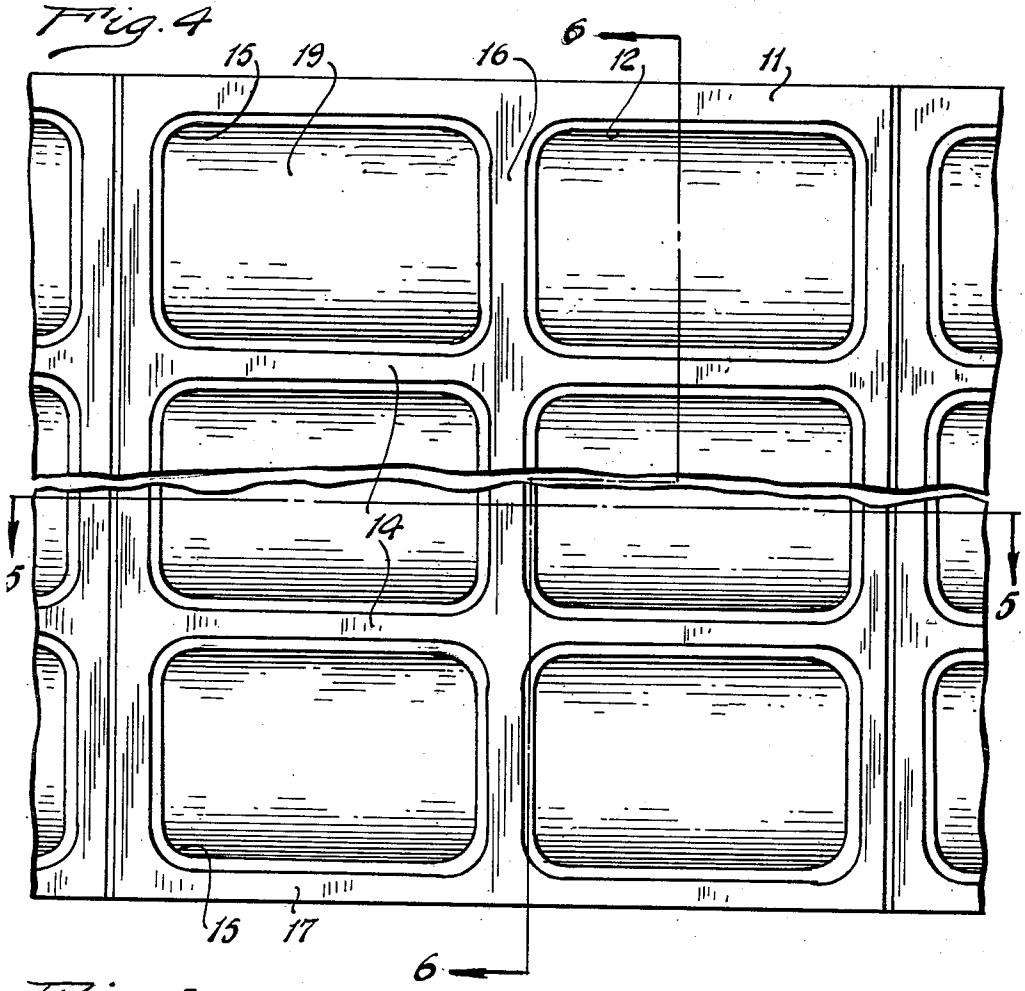
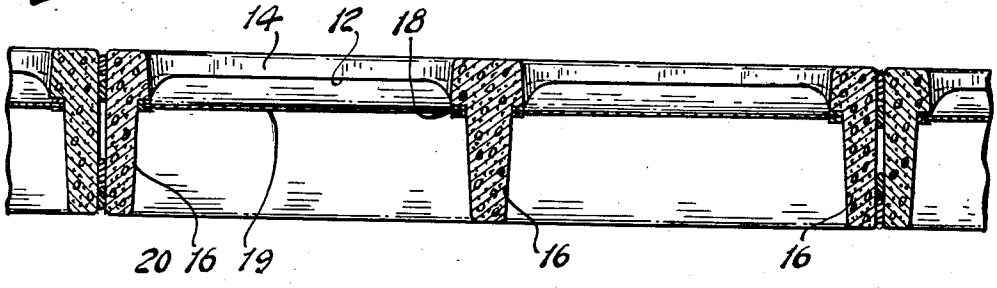


Fig. 5.



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EXPLOSION VENTING CONSTRUCTION FOR BUILDINGS

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Fig. 6

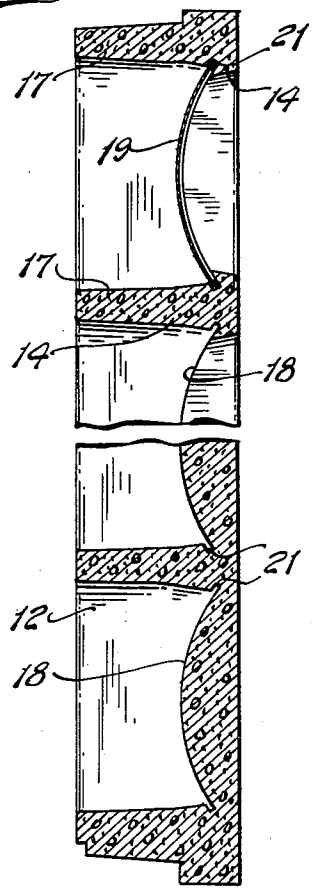


Fig. 7

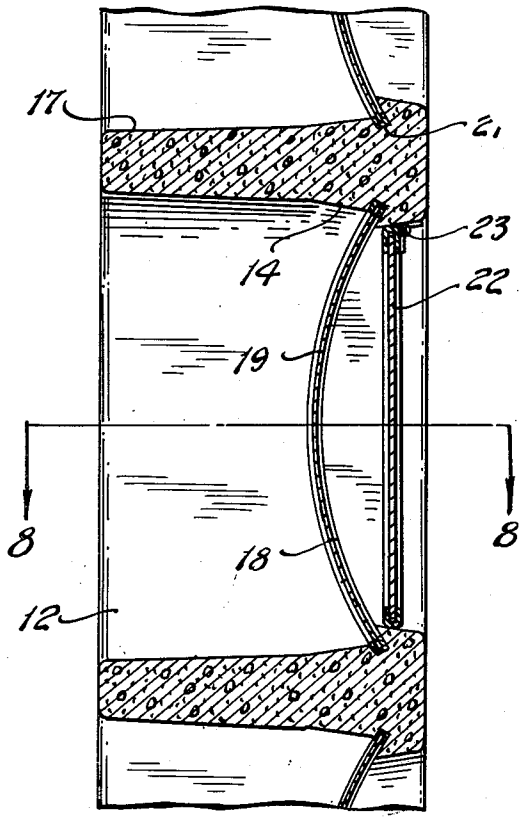
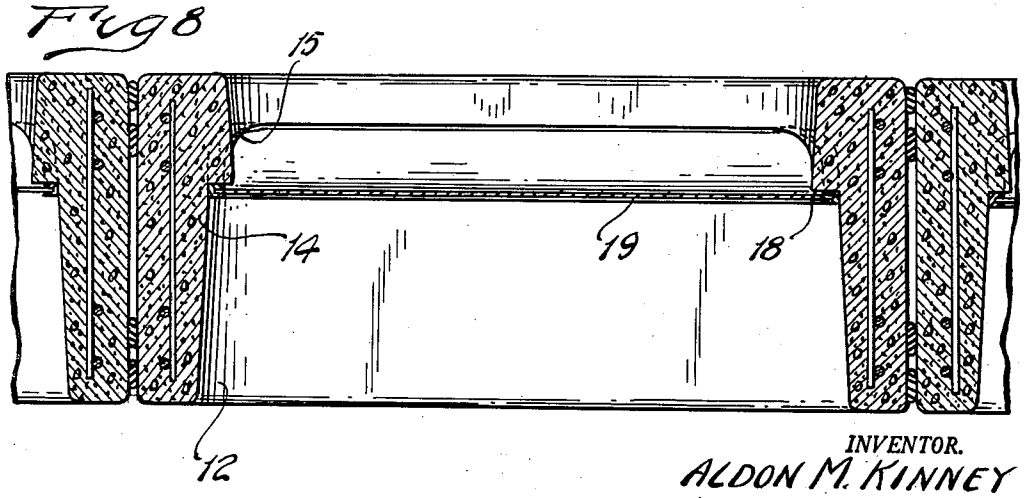


Fig 8



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3,112,535
EXPLOSION VENTING CONSTRUCTION FOR BUILDINGS

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Filed Jan. 11, 1960, Ser. No. 1,611
2 Claims. (Cl. 20—56.4)

The invention relates to buildings and is concerned with an improved building construction to provide adequate venting in case of explosion. More particularly the invention relates to a new type of window construction which permits the ejection of the window panels when the pressure within the building reaches a predetermined abnormal value requiring quick venting to avoid human casaulties and property damage.

While the invention in its broader aspects may be embodied in widely divergent specific constructions, the preferred embodiment contemplates that the normally closed window areas of the building wall are each ejected as a unit. The window closures themselves are made of a material which is resistant to shattering or breakage under explosive conditions. The mounting of the window in its frame in the building wall is designed to facilitate its quick removal without damage. The mounting is also designed to facilitate initial installation during building construction and reinstallation after ejection of the window under explosive conditions.

Although the invention may be applied to a single window if so desired, it is particularly useful in a building in which the window area has a high ratio with respect to the total wall area. The invention is also well adapted to be used with prefabricated panel walls.

The principal object of the invention is to provide a building suitable for manufacture of chemicals, which building is so constructed as to withstand explosive forces with a minimum amount of damage to the building itself while maintaining safety of its occupants.

In carrying out this objective, the invention contemplates a construction allowing a maximum use of the outside walls of the building for explosion venting while at the same time providing a design which is pleasing to the eye and relatively indestructible. Furthermore, the invention has for an important objective the provision of an explosion venting design for outside building walls which is adequate to meet safety requirements for the entire building without the necessity of special venting equipment through the roof.

An essential requirement of the explosion venting construction of this invention is that it will meet the explosion venting requirements of insurance underwriters and building code authorities for buildings which use flammable solvents and other hazardous materials in the operations for which the building is designed. The present invention permits immediate explosion release, thereby reducing damage to production equipment, building structure and personnel.

The invention includes the use of plastic glazing to eliminate the hazard to personnel from broken glass if an explosion should occur. Plastic glazing incorporated in the building walls according to the principles of the present invention, remains undamaged upon release from the framing members and is expelled outwardly from the wall and falls harmlessly to the ground. The undamaged plastic panels can then be reset in the building frame as a part of the clean-up operation following the explosion.

Other objects of the invention will be more apparent after consideration of the detailed description hereinafter set forth and illustrated in the accompanying drawings.

In the accompanying drawings:

FIGURE 1 is a perspective view of a building in which the invention has been incorporated.

FIG. 2 is an enlarged vertical section on the line 2—2 of FIG. 1.

FIG. 3 is an enlarged vertical section on the line 3—3 of FIG. 1.

FIG. 4 is an elevational view of a concrete panel provided with window openings in accordance with the invention.

FIG. 5 is a horizontal section on the line 5—5 of FIG. 4.

FIG. 6 is a vertical section on the line 6—6 of FIG. 4.

FIG. 7 is an enlarged fragmentary vertical section of a modified construction.

FIG. 8 is a horizontal section on the line 8—8 of FIG. 7.

FIG. 9 is a fragmentary vertical section illustrating the sealing between window and panel.

FIG. 10 is a vertical section of a modified construction.

Referring now to the drawings, there is shown in FIG. 1 a perspective view of a building incorporating the present invention. It will be observed that most of the outside walls of the building have a high proportion of window area, with only a relatively small amount of the total area in the form of the structural elements of the building. Each window opening is provided with a closure panel so constructed and arranged that it will be quickly ejected as a unit from the surrounding structure when an explosion takes place within the building. The details of the construction are better illustrated in FIGS. 2 and 3 which are each vertical sections on an enlarged scale. In these views the building foundation is indicated at 10 and on this foundation are a plurality of prefabricated reinforced concrete sections 11, each of which is preferably of a size to contain several of the window openings 12. The concrete sections 11 are arranged side by side and in tiers, one above the other, and secured in position to form a complete structural wall by the usual methods of uniting prefabricated sections. The concrete sections are shown in elevation in FIG. 4 and further illustrated by the horizontal section of FIG. 5 and the vertical section of FIG. 6.

The sections 11 are provided with the generally rectangular window openings 12 formed by the marginal walls 14 with rounded corners 15. Between adjacent window openings the prefabricated sections constitute a series of vertically extending ribs 16 and a series of horizontally extending ribs 17.

The closure panels 19 are of plastic and as manufactured they are flat sheets of generally rectangular form with rounded corners, composed of a transparent or translucent plastic. The means for securing the plastic panels to the concrete sections is such as to provide a mounting of a permanent nature resistant to displacement under all ordinary circumstances but so constructed and arranged as to permit outward release whenever there are abnormal conditions which require sudden venting of the interior of the building as a safety measure. Thus, the plastic panels can be bent into a convex form to fit within the window opening, with the side margins abutting the arcuate ledges 13 formed in the concrete sections and the upper and lower margins engaging slots or grooves 21.

One of the advantages of the bowed form of closure is that pressure on the inside face tends to deform the panel to increase the bowing effect and consequently to assist in the ejection of the panel through the opening in the wall. While the convex deformation may be either in a vertical or a horizontal direction, it is illustrated in FIG. 6 as extending from top to bottom. It will also be seen from FIG. 6 that grooves 21 are formed in the build-

ing wall both at the top and bottom of the window opening, and each groove extends in a direction corresponding to the direction of the bowed panel when fitted in place. With this arrangement the plastic panel is readily ejected whenever the gaseous pressure on the convex side is in excess of a predetermined value and the panel will thereupon be expelled through the flaring opening in the building wall and will fall harmlessly to the ground.

As hereinbefore set forth, the invention has for its primary object the provision of explosion venting in buildings but the novel construction of panel mounting can also be utilized in other types of building construction and for other advantageous purposes. Thus, as shown in the modification of FIGS. 7 and 8, the convex panel **19** can be mounted in the same manner as heretofore described but within the structural wall of the building there can also be arranged a conventional type of window **22**. In this type of construction the convex panel serves the purpose of a storm window to provide insulation between the two closures. This type of construction finds particular advantage for use in an office section of the same building which also houses the chemical manufacturing department. It is desirable that the overall appearance of the building should harmonize both in the office section and the factory section. In the unusual event of an explosion in that section of the building using the conventional window **22**, the force of the explosion would shatter the conventional window but at the same time would permit the ejection of the convex panel **19** in the same manner as heretofore described. The inside window **22** is hinged at **23** to permit in swinging in order to provide access to panel **19**.

In FIG. 9 a modified sealing construction is illustrated. Here the grooves **21** in the wall construction are formed in the concrete as previously described but are of a width to permit insertion of a sealing gasket **25**. This gasket has outside dimensions to fit within the groove and is formed with a slot **26** to receive the edge **24** of the plastic panel **19**. Preferably, the slot is laterally offset with respect to the center line of the gasket, leaving a lip **27** of narrow width on one side of the panel and an enlarged area **28** on the other side, apertured to provide resiliency. The gasket may be made of rubber or other material used for sealing purposes.

In FIG. 10, another modified sealing construction is illustrated. In this arrangement, the groove **21** is of a width to receive a sealing gasket **29** which is arranged peripherally around two panels **30**, **31**. The panels **30**, **31** are plastic sheets as in the previous embodiments described but are held in spaced apart relation by the sealing strip **29** so as to provide an air space **32** therebetween. The sealing strip **29** secures the two panels **30**, **31** together around the entire periphery.

From the above description it will be understood that the invention provides a simple method of obtaining explosion release for perimeter walls to meet the explosion venting requirements of insurance underwriters and building code authorities for structures which utilize flammable solvents and other hazardous materials in their operation.

The invention permits immediate explosion release and thereby reduces damage to production equipment, building structure and personnel. The use of plastic glazing in lieu of glass eliminates the hazard to personnel from broken glass should an explosion occur. Plastic glazing remains undamaged upon release from the framing members in internal explosion and falls harmlessly to the ground. These same undamaged panels can be reset in the building frame as part of the clean-up operation following the explosion. The flexed position for the plastic panels permits the use of a larger glazing panel than that which could be used if the glazing was installed in a flat plane, since the flexed position provides greater resistance to external wind load.

As previously stated, the closure panels **19** are manufactured as flat sheets and are bent into convex form

when they are inserted in the window openings. Each panel is made of a transparent or translucent plastic material which can be readily flexed into a convex form of substantial curvature as indicated in the drawings. The plastic selected is one that has suitable light transmitting properties and heat transmitting properties. Furthermore, the plastic must be resistant to shock so as to withstand the effect of explosive forces as well as the shock produced by the fall of the panel after it is ejected from its mounting. For example, the panel can be made of a fiberglass-reinforced polyester plastic. One suitable material is sold under the trademark "Filon" by The Plastics Corporation, El Segundo, California. When an explosion occurs, ejection of the panel is facilitated by the fact that the window opening is of gradually increasing cross section by reason of the outwardly flaring marginal walls.

In addition to the concrete framing system contemplated by the illustrated specific embodiments, the invention can readily be adapted for use with steel and other conventional framing systems. Its use can also be considered for masonry buildings by precasting sections as already described and then introducing such sections into a masonry wall opening as is presently done with conventional window frames.

While the specification has completely described a specific embodiment of the invention and the best mode contemplated for carrying out the invention, it is to be understood that the invention is not limited to the specific embodiments described but includes all within the purview of the claims as hereinafter set forth.

What is claimed is:

1. A building having a side wall provided with frame structure defining a generally rectangular opening therein, a generally rectangular panel formed of a flexible, non-fragile material closing said opening, the inner face of the panel being exposed to the interior of the building, said panel comprising two spaced plastic sheets marginally secured together around their entire peripheries, said frame structure having means forming a pair of outwardly bowed ledges along two opposite sides of the opening, said opening being unobstructed in an outward direction at said ledges, said frame structure having means along the other pair of opposite edges of the opening forming grooves for reception of opposite edge portions of the panel, said grooves being spaced from one another to maintain said panel flexed into a bowed contour in an outwardly convex direction with its bowed opposite edge portions seated against the outer surfaces of said ledges and with its other pair of opposite edges seated in said grooves such that upon further bowing of the panel in an outward direction in response to the application of pressure to the inner face of the panel such as might result from an explosive force within the building, said last mentioned edge portions of the panel, by reason of said further flexing, are retracted from said grooves to permit ejection of the panel as a unit from the window opening.

2. A building having a side wall provided with frame structure defining a generally rectangular opening therein, a generally rectangular panel formed of a flexible, non-fragile material closing said opening, the inner face of the panel being exposed to the interior of the building, said frame structure having means forming a pair of outwardly bowed ledges along two opposite sides of the opening thereof, said opening being unobstructed in an outward direction at said ledges, said frame structure having means along its other pair of opposite edges for engaging and interlocking with the other opposite edge portions of the panel, said last mentioned means being spaced from one another to maintain said panel flexed into a bowed contour in an outward direction with its bowed opposite edge portions seated against the outer surfaces of said ledges and with its other pair of opposite edges interlocked with said last mentioned means, said last mentioned means being adapted to release said edge

portions and the panel as a unit so that the panel is ejected from the opening upon the panel being further bowed outwardly by pressure applied to the inner face thereof such as might result from an explosive force within the building.

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