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Chambers et al.

[11] **3,775,915**

[45] **Dec. 4, 1973**

[54] **EXPLOSION VENTING WALL**

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[52] **U.S. Cl.** **52/1,** 49/141, 52/98, 52/204

[51] **Int. Cl.** **E04h 9/02,** E04h 9/14

[58] **Field of Search** 52/1, 98–100, 52/204, 573; 49/31, 141

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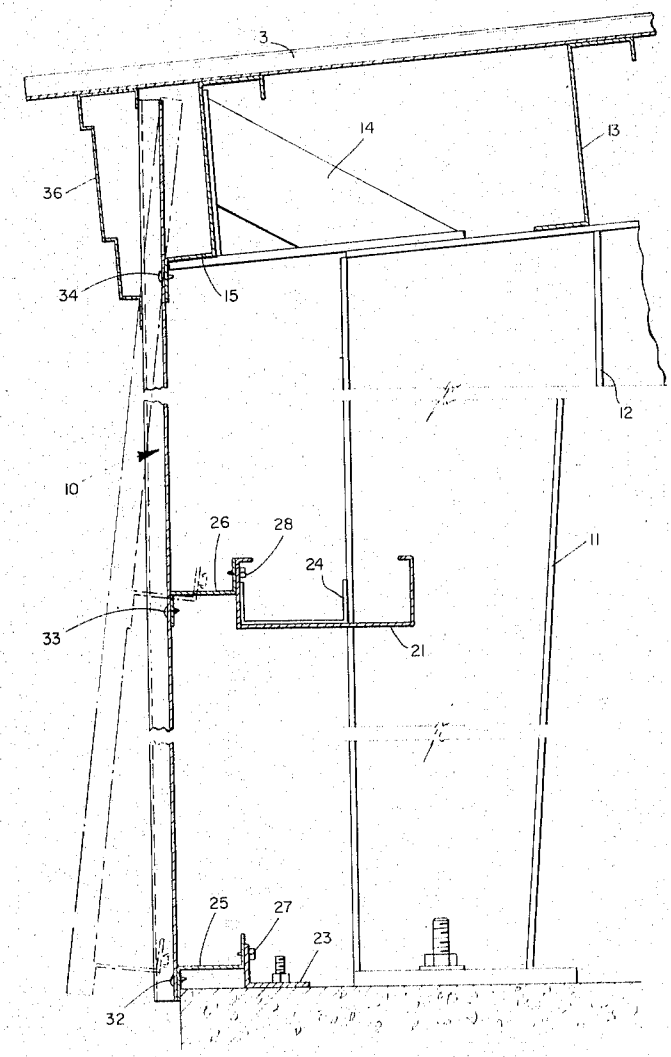
Primary Examiner—Alfred C. Perham

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[57] **ABSTRACT**

In a pre-engineered metal building a wall having an opening closed off by a panel connected by a number of fasteners which will insure weather, structural and wind load integrity under normal conditions but which will allow the panel to swing away upon the occurance of an interior explosion and thus provide a pressure relieving vent.

2 Claims, 5 Drawing Figures



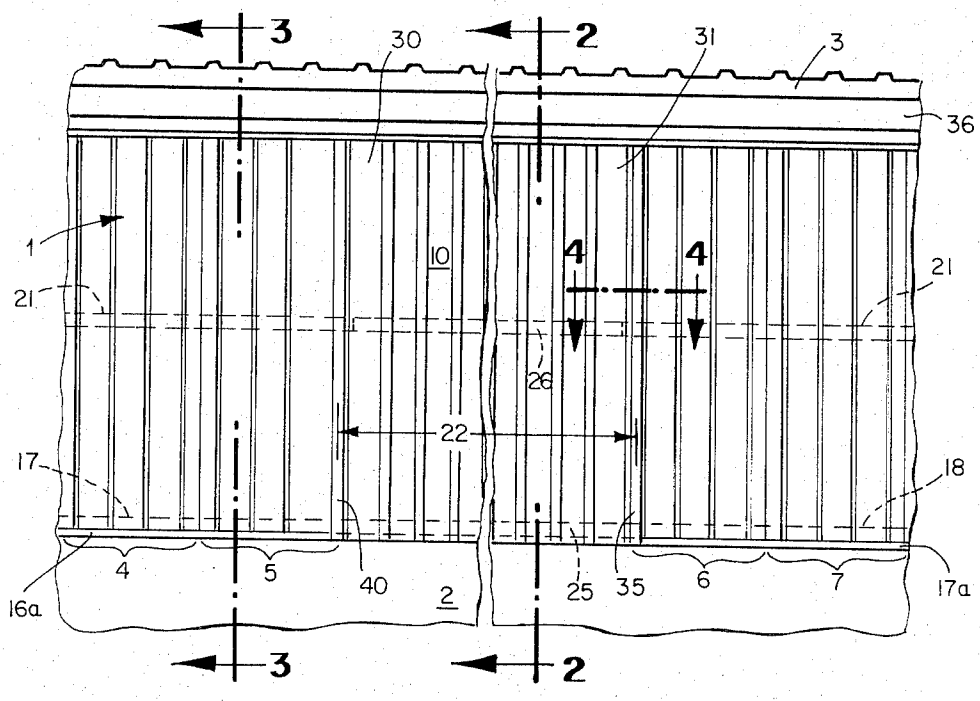


Fig. 1

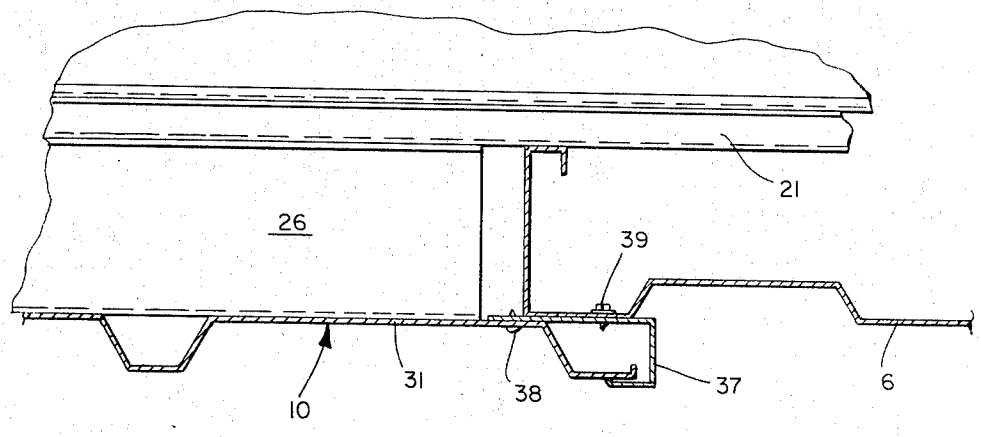


Fig. 4

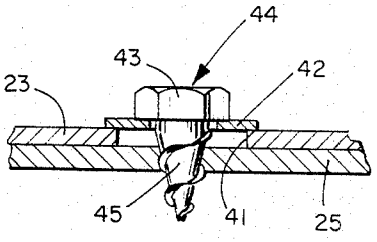


Fig. 5

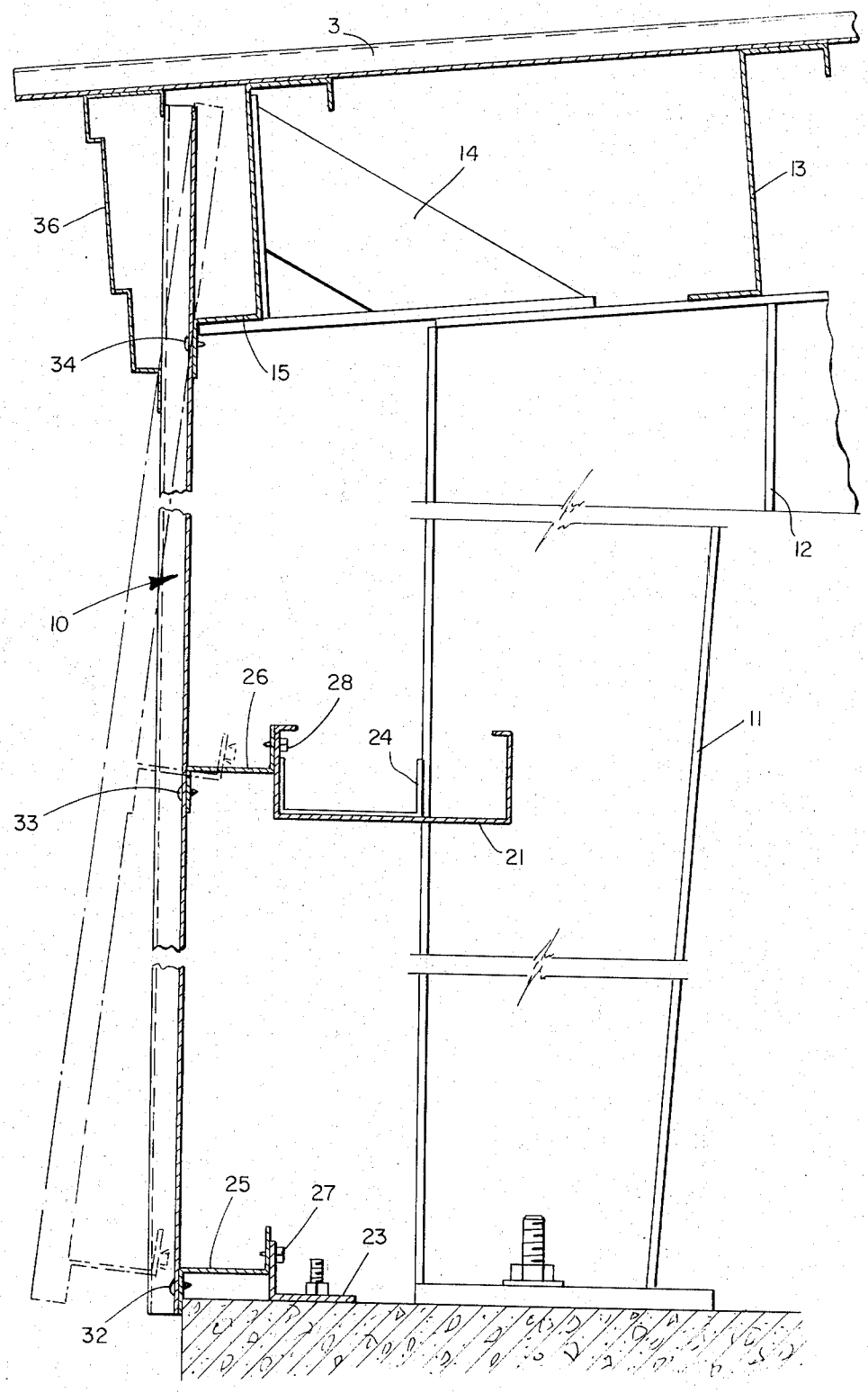


Fig. 2

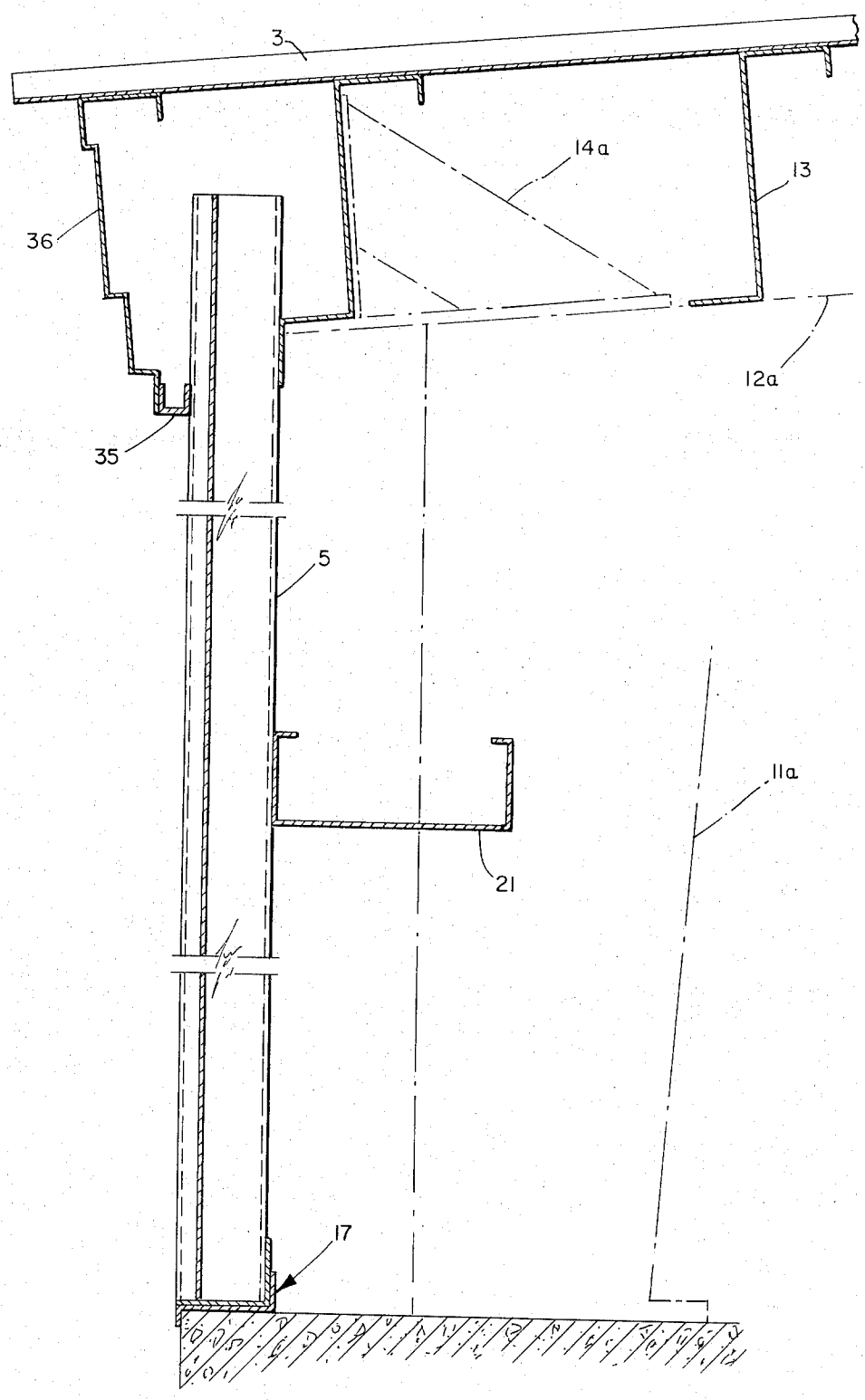


Fig. 3

EXPLOSION VENTING WALL

This invention relates to pre-engineered metal buildings and in particular relates to a wall panel for such buildings which has the functional characteristic of a normal wall but which will open in the event of an interior explosion and provide a pressure relieving vent.

The invention contemplates an explosion venting structure in which the normal wall has an opening covered by a panel held in place with a sufficient number of fasteners to insure the normal wall functions such as the weather sealing and ability to withstand windloads, impact loads and the like. Some of the fasteners holding the panel are explosion sensitive in that they are capable of being pulled out of locked position by the force of the panel being pushed outwardly by the pressure of an internal explosion. The explosion sensitive fasteners are located with respect to fixed fasteners so that one edge of the panel remains fixed while the released portion of the panel swings away out from the building like a door and thus provides the pressure relieving opening.

The primary advantages of the invention are that the explosion venting panel maintains the desired weather sealing and load characteristics of the building wall and will relieve explosion pressure practically immediately so as to save the building from destruction and will do so without flying away from the building and thus minimize liklihood of injury to person and property.

The preferred forms of the invention will be described below in connection with the following drawings wherein:

FIG. 1 is a fragmentary elevational view of the wall of a building incorporating the invention:

FIG. 2 is an exploded elevational view taken along the lines 2—2 of FIG. 1.

FIG. 3 is an exploded elevational view taken along the lines 3—3 of FIG. 1.

FIG. 4 is an enlarged planar view taken along lines 4—4 of FIG. 1.

FIG. 5 is an enlarged sectional view of an explosion sensitive fastener arrangement.

In FIG. 1 a pre-engineered building includes the explosion venting wall 1 which extends vertically from the concrete floor or foundation 2 upwardly to the roof 3. The wall includes the fixed panels 4, 5, 6 and 7 together with the explosion venting panel means 10. As will be understood by those skilled in the art the walls and roof of the building are supported by conventional interior supporting structure such as sidewall columns, roof gliders, roof purlins, wall girts and the like. Thus, the floor 2 supports the side columns and there being at least a pair of such columns along each side, such a column being indicated at 11 in FIG. 2 and by the dotted lines 11*a* in FIG. 3. The columns 11 and 11*a* and corresponding columns on the opposite side of the building are connected to the support means for the roof 3. The support means includes the girders 12 and 12*a* on the columns, the purlins 13 and the eave brackets 14 and 14*a* on the girders, the eave strut 15 and 15*a* on the eave struts. The roof 3 which is comprised of panels secured to the eave struts and purlins. The type of structure just described is illustrated in U.S. Pat. No. 3,611,661 owned by the assignee of this invention and in assigned publication PDF 372 SPECIFICATION DATA.

The fixed panels 4, 5, 6 and 7 are preferably of the type shown in U.S. Pat. No. 3,568,388 assigned to the assignee of the present invention. The panels 4 and 5 are connected to the floor 3 by base channel and flashing 17. The panels 6 and 7 are connected to the floor by the base channel and flashing 18. The center sections of the panels 4, 5, 6 and 7 are joined to the girt 21 supported on the end columns. The manner of mounting the panels 4, 5, 6 and 7 as above described is shown in said U.S. Pat. No. 3,568,388 and also in said publication PDF 372.

With reference to FIG. 1 the panels 5 and 6 are spaced apart and thereby form an opening 22 which is covered by the explosion venting panel 10. When the panel 10 moves away from the wall under the force of an explosion, the opening relieves the interior pressure.

The structure of the panel 10 and the manner in which the same is sensitive to an interior explosion is explained below.

With reference to FIG. 2 a base angle 23 is secured to the floor 2. The base angle extends across the opening 22 and abutes the base channels 17 and 18. The column 10 carries the girt bracket 24 which supports the girt 21. The base angle 23 carries a bottom spacer 25 which extends across the opening 22. The opposite ends of the spacer are spaced from the edges of panels 5 and 6 so as not to interfere with outward movement of the panel 10. The girt 21 carries spacer 26 which extends parallel to and coextensive with the spacer 25. The spacer 25 is connected to the base angle by the explosion sensitive fastener means 27, while the spacer 26 is connected to the girt 21 by the explosion sensitive fastener means 28.

The panel 10 is comprised of one or more individual panels including the end panels 30 and 31. These panels are secured to the lower spacer 25 by standard fasteners 32 and the upper spacer 26 by the standard fasteners 33. At the top the panels are connected by the standard fasteners 34 to the eave strut 15.

The fasteners 32, 33 and 34 are serially spaced along the panel 10.

With reference to FIG. 4 it will be noted that the end panel 31 of panel 10 overlaps the panel 6. This is accomodated by thickness of spacers 25 and 26 positioning the eave strut 14 outwardly with respect to the strut 14*a*. Also with reference to FIGS. 2, 3 and 4 the outside surface of panel 10 is spaced outwardly of the fixed panels 4, 5 etc. Because of this a filler piece 35 is used along the panels 4, 5 etc. for attaching the eave trim 36. It will be understood that the conventional sealer material not shown is used at the top and bottom of each panel to fill up the spaces created by the panel ribs.

As mentioned above, the edges of the end panels 30 and 31 overlap the panels 5 and 6. Each overlap is covered by a trim piece. Thus, with reference to FIG. 4 the edge of panel 31 carries trim 37 which is secured to the panel by the conventional fastener 38. Several fasteners 38 are serially vertically spaced. The trim 37 is secured to the panel 6 as by the explosion sensitive fastener 39. Several of the fasteners 38 are serially vertically spaced. The edge of the end panel 30 has a trim piece 40 which is arranged as described above.

With respect to the conventional fasteners 32, 33 and 34 and the explosion sensitive fasteners 27, 28 and 39, a sufficient number are used to securely lock the panel 10 in place to insure desired mechanical strength and to insure proper sealing qualities.

The explosion sensitive fastener arrangement at 27, 28 and 39 are shown in detail in FIG. 4. Each arrange-

ment is identical so assume that FIG. 4 is for the base angle and bottom spacer arrangement.

The spacer 25 has a release hole 41 which is covered by washer 42. The head 43 of the screw 44 bears on the washer and the threaded shank 45 is threaded into the base angle 23. The head 43 is smaller in diameter than the diameter of the release hole 41. The washer is made of a ductil metal such as aluminum. The strength of the washer is chosen so that the head can be tightened down whereby the fastener locks the joined parts together so that the wall has a normal structural and leakage integrity. However, when subjected to heavy pulling force the washer will "give" and allow the head and washer to pass thru the release hole.

It will be apparent that the pressure of an internal explosion exerts a force on the panel 10 which tends to move the same outwardly. This pulls the heads of the fasteners 27, 28 and 39 against their respective washers. The washers yield and allow the heads of the washers to pass thru the release holes. The standard fasteners 34 at the top of panel 10 tend to maintain the panel fixed against the support structure. Thus the panel 10 follows the path of leastresistance and starts to swing outwardly with the area around the fastener 34 acting as a pivot. As soon as the panels swing outwardly, the opening 22 relieves the internal pressure. The pressure relief reduces the force acting on the side walls and the roof which otherwise might destroy the building.

Before closing it is pointed out that the explosion sensitive fastener arrangement of FIG. 5 can be reversed least resistance position. For example, if the part 23 is moved upwardly (as viewed in FIG. 5) while part 25 remains fixed, the threads 45 hold the fastener on part 25 and the motion of part 23 bends the washer 42 around the head 43 and permits the part 23 to pass over the head. When the foregoing is used in the arrangement at 27 and 28 the screws 44 are inserted on the opposite side to that shown; i.e. with the washers engaging the respective spacers. In either case, the threads of the screw must be capable of holding the screw so that it moves out with the spacers (as shown) or remains fixed while the spacers move out. The arrangements are mechanical equivalents.

We claim:

1. In a pre-engineered metal building having interior supporting structure:

a vertically extending wall having a rectangular shaped explosion venting opening formed therein;

means connecting the wall to the supporting structure;

explosion venting panel means forming part of the wall and extending across the opening and overlapping the opening at least along the vertical sides thereof;

adjacent each overlap, trim means connected to the panel and extending over and covering the overlap;

explosion sensitive side fastener means serially spaced along each vertical side, explosion sensitive bottom fastener means serially spaced along the bottom of said panel and top fastener means serially spaced along the top of said panel, the top fastener means connecting the top of the panel to said supporting structure;

the explosion sensitive side fastener means connecting the panel and each trim piece to the wall and each side fastener means including a release hole in the wall, a washer extending over the release hole, a headed screw, the head of the screw bearing on the washer and being of smaller diameter than the release hole and the threaded shank of the screw extending thru the washer, thru the release hole and being connected to the trim piece;

the bottom fastener means connecting the panel to said supporting structure and each bottom fastener means including a release hole in the supporting structure, a washer extending over the release holes, a headed screw, the head of the screw bearing on the washer and being of smaller diameter than the release hole and the threaded shank of the screw extending thru the washer, thru the release hole and being connected to the panel; and

when an interior explosion generates sufficient force on the explosion venting panel, the panel pulling the washers and heads of the headed screws thru their respective release holes and said top fasteners acting as pivots about which the panel rotates to form an opening which relieves the interior explosion pressure.

2. In a pre-engineered metal building having, a floor and a roof, at least one pair of spaced apart columns mounted on the floor, support mechanism connected between the columns and the roof and supporting the same, a base fastened to the floor in a position adjacent the columns, at least one wall girt connected to the columns and extending parallel the base, a pair of outside wall panels extending from the floor upwardly adjacent the roof and connected to the base, to the girt and to the support mechanism, the panels being spaced apart to form a wall opening, the improvement of an explosion-venting wall covering said opening comprising;

first spacer and a second spacer respectively connected to the base and to the girt and extending parallel the floor within the confines of said opening;

a plurality of explosion sensitive fastener means connecting the first spacer to the base, each fastener means including a release hole in the base, a washer extending over the release hole, a threaded screw the head of the screw bearing on the washer and being of smaller diameter than the release hole and the threaded shank of the screw extending thru the washer, thru the release hole and being threaded into the first spacer;

a plurality of explosion sensitive fastener means connecting the second spacer to the girt, each last said fastener means including a release hole in the girt, a washer extending over the release hole, a headed screw, the head of the screw bearing on the washer and being of smaller diameter than the release hole and the threaded shank of the screw extending thru the washer, thru the release hole and being threaded into the second spacer;

explosion venting panel means extending over said wall opening, the opposite edges of the vent panel respectively overlapping the edges of said wall panels which form said wall opening;

a plurality of bottom fasteners connecting the panel to the first spacer, a plurality of intermediate fasteners connecting the panel to the second spacer and a plurality of top fasteners connecting the panel to said support mechanism;

adjacent each overlap, a trim piece extending over and covering the overlap;

a plurality of fasteners respectively securing the trim pieces to the vent panel;

a plurality of explosion sensitive fasteners respectively connecting the trim pieces to the wall panels, each fastener means including a release hole in a wall panel, a washer extending over the release hole, a headed screw, the head of the screw bearing on the washer and being of smaller diameter than the release hole and the threaded shank of the screw extending thru the washer, thru the release hole and being threaded into the trim piece; and

when an interior explosion generates sufficient force on the explosion venting panel, the panel pulling the washers and heads of the headed screws thru their respective release holes and said top fasteners acting as pivots about which the panel rotates to form an opening which relieves the interior explosion pressure.

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