The explosion-safe wall includes a canvas wall structure and a wall support frame fixedly anchored to the ground. The canvas wall structure defines opposite and second sides facing in respective opposite first and second tangential directions and comprises a brace assembly including a number of braces each having a convex brace wall oriented towards the first tangential direction. The canvas wall structure also comprises brackets fixedly attaching the brace assembly to the wall support frame, at least one canvas panel, and a number of yieldingly releasable attachment joints releasably attaching the canvas panel to corresponding braces, with the attachment joints defining a yielding resistance threshold. Upon a blast impinging on the canvas panel towards the second tangential direction with sufficient force to overcome the yielding resistance threshold of the attachment joints, the attachment joints will yieldingly release the canvas panels from their corresponding braces, with the convex brace walls oriented towards the first tangential direction providing an aerodynamic shape that will deflect the blast to help prevent the blast from blowing the braces away.
WALL STRUCTURE WITH RELEASABLE CANVAS PANELS AND AERODYNAMIC CANVAS PANEL SUPPORTING BRACES

CROSS-REFERENCE DATA

[0001] The present application claims priority under the Paris Convention of co-pending provisional patent application No. 60/436,019 filed on Dec. 26, 2002, by the present applicants.

FIELD OF THE INVENTION

[0002] The present invention relates to a wall structure with releasable canvas panels and aerodynamic canvas panel support braces that can withstand explosions that will desirably blow the canvas panels away to exhaust the explosion blast force.

BACKGROUND OF THE INVENTION

[0003] In wood shops, a high density of airborne dust particles is present due to the wood sawing that occurs therein. These airborne dust particles may cause so-called dust explosions when a spark is triggered for some reason, for example as a result of static or a spark being formed in an electric machine in the wood shop. Once a spark ignites the airborne dust particles, a dust explosion with a potentially significant blast force occurs.

[0004] It is common for the wood shops to comprise a wall support frame formed of a number of spaced-apart vertical ground-engaging posts between which metallic sheets are releasably attached. Indeed, these metallic sheets are destined to be released upon a sufficient blast force impinging thereon: a dust explosion occurring in the wood shop will cause a blast that will rip the metallic sheets away from the beams to which they are attached, and blow the metallic sheets distantly outwardly of the wood shop structure.

[0005] This releasable attachment of the metallic sheets to the wall support frame is important, since it allows to exhaust the blast force from the wood shop. If fixed, non-releasable wall panels were to be used, then the energy released by the blast explosion would be maintained within the confines of the wood shop, which would be more likely to cause important damage within the wood shop and injure workers therein. Thus, these releasable metallic wall sheets are desirable.

[0006] However, a common problem in conventional wood shops relates to the fact that the metallic sheets being blown away from the beams to which they are attached, are expelled at high velocity. This often damages material located in the vicinity of the wood shop, and sometimes injures workmen.

[0007] It is to be noted that a need for explosion-safe walls comprising releasable panels is present not only in wood shops, but also in other fields of operation, such as in chemical warehouses or laboratories for example, where it is advantageous to exhaust eventual explosions blasts from within the confines of the enclosure where the explosions occur.

SUMMARY OF THE INVENTION

[0008] The present invention relates to a canvas wall structure for use on a wall support frame upstanding from the ground, said canvas wall structure defining opposite first and second sides facing in respective opposite first and second tangential directions and comprising:

[0009] a brace assembly destined to be mounted to the wall support frame and comprising a number of braces each having a convex brace wall oriented towards said first tangential direction;

[0010] at least one canvas panel; and

[0011] a number of yieldingly releasable attachment joints releasably attaching said at least one canvas panel to corresponding said braces, said attachment joints defining a yielding resistance threshold;

[0012] wherein upon a blast impinging on said at least one canvas panel towards said second tangential direction with sufficient force to overcome said yielding resistance threshold of said attachment joints, said attachment joints will yieldingly release said canvas panels from said corresponding braces, with said convex brace walls oriented towards said first tangential direction providing an aerodynamic shape that will deflect the blast to help prevent the blast from blowing said braces away.

[0013] In one embodiment, said braces comprise a leading edge oriented towards said first tangential direction and inclined brace walls receding from said leading edge towards said second tangential direction, said leading edge and receding brace walls forming said convex brace wall.

[0014] In one embodiment, said braces each have a triangular cross-section with said leading edge corresponding to one edge of said triangular cross-section and with said receding brace walls corresponding to first and second flat brace walls converging towards and linked at said leading edge.

[0015] In one embodiment, said braces each define a third flat brace wall linking said first and second brace walls and facing towards said second tangential direction, with said at least one canvas panel being attached to said third flat brace walls with said releasable attachment joints.

[0016] In one embodiment, said braces comprise a hollow rigid outer shell having said triangular cross-section, and an insulating inner filler within said hollow rigid outer shell.

[0017] In one embodiment, said number of braces are arranged in an array of successive horizontally spaced-apart vertical braces linked by horizontal braces to form said brace assembly.

[0018] In one embodiment, said canvas wall structure further comprises a number of additional canvas panels, with each said canvas panel being attached between corresponding bordering horizontal and vertical braces.

[0019] In one embodiment, said canvas wall structure further comprises brackets for fixedly attaching said brace assembly to the wall support frame, said brackets supporting corresponding ones of said horizontal and vertical braces.

[0020] In one embodiment, said brace assembly comprises attachment members allowing some of said braces to be attached to other corresponding braces.

[0021] In one embodiment, said attachment joints each comprise a bolt threadingly engaging said third brace wall of a corresponding said brace, said bolt having a head portion
protruding away from said third brace wall, and said canvas panel comprising a peripheral lip portion which has holes that are larger than said bolt heads, said attachment joints each further comprising a yieldingly deformable washer having an inner hole that is engageable by said bolt and that is smaller than said bolt head, and an outer diameter that is larger than said holes in said canvas panel peripheral lip portion, said bolt engaging both said washer and said canvas panel holes to attach said canvas panel lip portion to said third brace wall, said yieldingly deformable washers defining said yielding resistance threshold by being capable of deformably releasing said bolt heads upon an explosion blast impinging on said canvas panel with sufficient force.

[0022] The present invention also relates to an explosion-safe wall comprising a canvas wall structure and a wall support frame destined to be fixedly anchored to the ground, said canvas wall structure defining opposite first and second sides facing in respective opposite first and second tangential directions and comprising:

[0023] a brace assembly comprising a number of braces each having a convex brace wall oriented towards said first tangential direction;

[0024] brackets fixedly attaching said brace assembly to said wall support frame;

[0025] at least one canvas panel; and

[0026] a number of yieldingly releasable attachment joints releasably attaching said at least one canvas panel to corresponding said braces, said attachment joints defining a yielding resistance threshold;

[0027] wherein upon a blast impinging on said at least one canvas panel towards said second tangential direction with sufficient force to overcome said yielding resistance threshold of said attachment joints, said attachment joints will yieldingly release said canvas panels from said corresponding braces, with said convex brace walls oriented towards said first tangential direction providing an aerodynamic shape that will deflect the blast to help prevent the blast from blowing said braces away.

DESCRIPTION OF THE DRAWINGS

[0028] In the annexed drawings:

[0029] FIG. 1 is a front elevation of the outer surface of an explosion-safe wall comprising a wall support frame supporting a canvas wall structure according to the invention, with the canvas wall structure being shown with four canvas panels operatively installed thereon on the left-hand side of FIG. 1 and with four canvas panels being removed on the right-hand side of FIG. 1 to more clearly show the underlying brace assembly;

[0030] FIG. 2 is a partial enlarged perspective view of a portion of the brace assembly of the canvas wall structure of FIG. 1, including a horizontal brace and an pair of vertical braces linked to one another;

[0031] FIG. 3 is an enlarged partial top cross-sectional view of the explosion-safe wall taken along lines III-III of FIG. 1;

[0032] FIG. 4 is an enlarged partial side cross-sectional view of the explosion-safe wall taken along lines IV-IV of FIG. 1;

[0033] FIG. 5 is a partial perspective view of an I-beam of the wall support frame on which three braces are mounted with a bracket; and

[0034] FIG. 6 is a partial perspective cross-sectional view of a brace having a pair of canvas panels attached thereon.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0035] FIG. 1 shows an explosion-safe wall 10 comprising a canvas wall structure 12 according to the present invention, and a wall support frame 14 upstanding from the ground. The wall support frame 14 may be formed with any conventional structural elements, for example a number of upright posts 16 in the form of I-beams as shown in the annexed drawings. A ceiling (not shown) is conventionally installed atop posts 16.

[0036] As shown in FIGS. 1-6, canvas wall structure 12 defines opposite first and second sides 12a, 12b facing in respective opposite first and second tangential directions 13a, 13b (FIG. 4). In the case shown in the annexed drawings where canvas wall structure 12 is flat, first tangential direction 13a is oriented in a same direction at every point of first side 12a of canvas wall structure 12 and second tangential direction 13b is oriented in a same direction at every point of second side 12b of canvas wall structure 12. However, if canvas wall structure 12 was not flat, for example if it formed a closed loop to define an enclosure, as is usually the case, then it is understood that the first side 12a would face inside the enclosure and the first tangential direction 13a would be oriented generally radially towards the center of the enclosure, while the second side 12b would face outside of the enclosure and the second tangential direction would be oriented generally radially outside of the enclosure, and thus specific tangential directions would not be parallel everywhere along the surface of canvas wall structure 12. Any specific reference herein to inner or outer directions, respectively, refers to the fact that wall 10 is conventionally part of an enclosure and consequently defines an inner side 12a and an outer side 12b.

[0037] Canvas wall structure 12 comprises a brace assembly 18 having a number of braces 20a, 20b, 20c, 20d, 20e, that will be generally referred to herein as braces 20. Each brace 20, for example brace 20a shown in FIGS. 2 and 4, comprises a hollow rigid outer shell 22 having a triangular cross-section, and an insulating inner filler 24 within hollow rigid outer shell 22. Brace 20a more particularly defines first and second inner flat walls 26, 28 and a third outer flat wall 30, with the first and second inner flat walls 26, 28 converging towards first tangential direction 13a and forming a leading edge 32 at their junction line, with leading edge 32 facing in the direction of first tangential direction 13a. Consequently, first and second inner flat walls 26, 28 recede from leading edge 32 towards second tangential direction 13b, and third outer flat wall 30 faces in the direction of second tangential direction 13b.

[0038] More generally, leading edge 32 and receding inner walls 26, 28 form a convex wall generally facing in the first tangential direction 13a. It is understood that although the triangular shape of braces 20 shown in the annexed drawings is advantageous, other brace configurations having a generally convex geometry facing in the first tangential direction 13a are also envisioned.
It is further understood that braces 20b, 20c, 20b', 20c' have a same configuration as the above-described configuration of brace 20a.

Braces 20 are arranged in an array of successive horizontally spaced-apart vertical braces 20b, 20c, 20b', 20c' linked by horizontal braces 20a. More particularly, some vertical braces 20b, 20c, including upper braces 20b and co-extensive lower braces 20c, are disposed vertically along corresponding posts 16, and some vertical braces 20b', 20c', including upper braces 20b' and co-extensive lower braces 20c', are also disposed vertically although spacedly between posts 16.

As shown in FIGS. 1, 4 and 5, canvas wall structure 12 comprises brackets 34 that are fixedly attached (e.g. bolted) to posts 16. Brackets 34 are generally N-shaped, and each comprise an inner bracket portion 36 which is bolted to a corresponding post 16, an intermediate bracket portion 38 which is integrally fixed to and slopes downwardly away from inner bracket portion 36, and an outer bracket portion 40 which is parallel to inner bracket portion 36 and which extends both over and under its intersection with intermediate bracket portion 38 to which it is integrally fixed.

The two extremities of a horizontal brace 20a sit on corresponding brackets 34 that are attached to successive posts 16, and more particularly in the trough formed by the inclined intermediate bracket portion 38 and the upright outer bracket portion 40, and are bolted to outer bracket portions 40. The inclination of bracket intermediate portion 38 is designed to form with upright outer portion 40 a trough that corresponds to the shape of the triangular brace 20a, with the lower inner wall 28 thereof resting on bracket intermediate portion 38 and with the outer wall 30 of brace 20a vertically extending along and abutting against bracket outer portion 40. Brackets 34 can be shared by two co-extensive horizontal braces 20a (see the central bracket in FIG. 1).

Vertical braces 20b and 20c are installed respectively over and under bracket 34, and vertically extend adjacent and along a corresponding post 16. The lower extremity of the upper vertical braces 20b and the upper extremity of the lower vertical braces 20c are bevelled to snugly fit respectively over horizontal brace 20a and under bracket 34 between inner bracket portion 36, intermediate bracket portion 38 and outer bracket portion 40. Vertical braces 20b and 20c are bolted to outer bracket portion 40. Additional bracket members (not shown) could further be provided to attach the upper extremity of upper vertical braces 20b and the lower extremity of lower vertical braces 20c to posts 16.

As shown in FIG. 2, intermediate vertical braces 20b', 20c' are fixedly attached, e.g. bolted, to an intermediate portion of horizontal brace 20a by means of attachment members 42 in the form of flat rigid plates. The lower extremity of the upper vertical braces 20b' and the upper extremity of the lower vertical braces 20c' are bevelled to snugly fit respectively over and under horizontal brace 20a. Intermediate vertical braces 20b', 20c' are thus disposed spacedly between vertical braces 20b, 20c that extend along corresponding posts 16.

Generally, brace assembly 18 is attached to posts 16 by means of brackets 34, with each brace 20 being either attached directly to a corresponding bracket 34 or to another brace 20 by means of attachment members 42. It is understood that alternate arrangements of the braces 20 within brace assembly 18 and alternate attachments attaching brace assembly 18 to wall support frame 14 could also be envisioned without departing from the scope of the present invention.

Canvas wall structure 12 further comprises at least one canvas panel 44, and more particularly a number of canvas panels 44 each releasably attached to corresponding bordering braces 20. In the embodiment shown in FIG. 1, it can be seen that canvas panels 44 are disposed in two superposed rows, each canvas panel 44 being of a rectangular shape and being attached to brace assembly 18 along three sides, namely along its left and right edges, and along its bottom edge for the top row of canvas panels 44 and along its top edge for the bottom row of canvas panels 44.

FIGS. 3 and 6 show that each canvas panel 44 is formed of an outer fireproof sheath or envelope 46 enclosing an inner insulating material 48. A peripheral reinforced lip 50 is provided on sheath 46, with lip 50 having a number of spaced-apart through-holes 52 therein.

Canvas wall structure 12 also comprises a number of yieldingly releasable attachment joints 54 releasably attaching canvas panels 44 to corresponding braces 20. More particularly, attachment joints 54 comprise a bolt 56 threading along the outer wall 30 of brace 22 at its first end, and having a head portion at its second end projecting outwardly of brace 22. The head portion of bolt 56 is smaller than the holes 52 of canvas panel 44, and can thus freely slide in or out of holes 52.

Each bolt 56 engages a corresponding hole 52 and a deformable washer 58 located between the head of bolt 56 and canvas lip 50. Washer 58 has an inner hole smaller than the head of bolt 56 but an outer diameter larger than hole 52. Consequently, washer 58 will allow bolt 56 to attach the lip 50 of canvas panel 44 to brace 20. Washers 58 define a yield resistance threshold that will allow washers 58 to yieldingly deform to allow the head of bolts 56 to slide through washers 58 if a sufficient force is applied to separate bolts 56 from washers 58.

In use, an explosion-safe wall 10 as described hereinabove is designed to be erected in buildings or areas where explosions are likely, such as in woodshops for example. To erect such a wall, canvas wall structure 12 is installed on a wall support frame 14 which may be pre-existing or not; in the latter case, a wall support frame 14 is first installed for example by anchoring a number of spaced-apart upright I-beams 16 to the ground. To install canvas wall structure 12 on posts 16, brackets 34 are first attached to posts 16, and braces 20 are then attached to brackets 34. During this installation, care must be taken to orient the canvas wall structure 12 properly: the first or inner side 12a is oriented towards the inside of the enclosure to be formed, or more generally towards the area where an explosion is likely to occur, and the second or outer side 12b is oriented in the opposite direction. Braces 20 will help prevent the canvas panels 44 from sagging between consecutive posts 16.

When an explosion occurs, the blast of the explosion will propagate generally towards the second tangential
direction 13b and impinge on the first wall 12a of explosion-safe wall 10. If this blast has a sufficient force to overcome the yielding resistance threshold of attachment joints 54, and more particularly the yielding resistance threshold of washers 58, attachment joints 54 will yieldingly release one or more canvas panel 44 from their corresponding braces 20. This occurs due to the washers 58 yieldingly deforming to allow the heads of bolts 56 to slide through washers 58, which then allow the heads of bolts 56 to slide through holes 52 of canvas panels 44 to release the attachment of canvas panels 44 from braces 20, while bolts 56 remain attached to braces 20.

[0052] The specific shape of braces 20 which define a convex wall oriented towards the first tangential direction 13a provides an aerodynamic profile to braces 20 that helps prevent the blast from blowing braces 22 away. Indeed, braces 22 will be oriented with their leading edge 32 generally facing in the direction of the explosion, namely towards the first tangential direction 13a, and thus a blast generally oriented towards the second tangential direction 13b will be deflected by the inclined reeding walls 26, 28 of braces 20 when the blast hits braces 20. Such an explosion would consequently releasable canvas panels 44 from their corresponding braces 20 as described hereinabove if the blast force is sufficient to overcome the yielding resistance threshold of attachment joints 54, while the braces 20 would remain attached to wall support frame 14. Consequently, I-beams 16 and braces 20 are likely to remain unhindered by the explosion, while only canvas panels 44 will be forcibly removed by the explosion. This is desirable since it will prevent any rigid structural element from being expelled by the blast of the explosion, since only the soft canvas panels 44 will be expelled, thus preventing accidental injuries or material damages while still allowing to exhaust the explosion. Furthermore, the canvas panels may be simply reinstalled on braces 20 after an explosion occurs, which is neither an expensive nor a time-consuming operation.

[0053] According to an alternate embodiment of the invention, it is envisioned that the canvas wall structure be designed to allow it to be installed with either one of its sides oriented in the first tangential direction while still allowing the canvas panels to be released. This could be accomplished for example by attaching the canvas panels on a peripherally interior rim portion of the bordering braces with suitable attachment joints that are bi-directionally releasable (for example attachment strings that can be torn), and by providing convex walls on both the first and second sides of the braces.

[0054] According to another embodiment of the invention, it is further envisioned to provide a canvas wall structure comprising a single canvas panel, which could be supported by braces about its periphery and/or centrally of its periphery, for example by providing releasable attachment joints that project both from the periphery and from a central portion of the canvas panel. Thus, it can be seen that the canvas wall structure could comprise any number of canvas panels.

[0055] According to yet another embodiment of the invention, the releasable attachment joints could have other alternate designs, for example comprising portions that yieldingly deform, tear or otherwise allow the release of the canvas panels upon the blast of an explosion being sufficiently strong to overcome the yielding resistance threshold of the attachment joints.

1. A canvas wall structure for use on a wall support frame upstanding from the ground, said canvas wall structure defining opposite first and second sides facing in respective opposite first and second tangential directions and comprising:

   a brace assembly destined to be mounted to the wall support frame and comprising a number of braces each having a convex brace wall oriented towards said first tangential direction;

   at least one canvas panel; and

   a number of yieldingly releasable attachment joints releasably attaching said at least one canvas panel to corresponding said braces, said attachment joints defining a yielding resistance threshold;

   wherein upon a blast impinging on said at least one canvas panel towards said second tangential direction with sufficient force to overcome said yielding resistance threshold of said attachment joints, said attachment joints will yieldingly release said canvas panels from said corresponding braces, with said convex brace walls oriented towards said first tangential direction providing an aerodynamic shape that will deflect the blast to help prevent the blast from blowing said braces away.

2. A canvas wall structure as defined in claim 1, wherein said braces comprise a leading edge oriented towards said first tangential direction and inclined brace walls receding from said leading edge towards said second tangential direction, said leading edge and receding brace walls forming said convex brace wall.

3. A canvas wall structure as defined in claim 2, wherein said braces each have a triangular cross-section with said leading edge corresponding to one edge of said triangular cross-section and with said receding brace walls corresponding to first and second flat brace walls converging towards and linked at said leading edge.

4. A canvas wall structure as defined in claim 3, wherein said braces each define a third flat brace wall linking said first and second brace walls and facing towards said second tangential direction, with said at least one canvas panel being attached to said third flat brace walls with said releasable attachment joints.

5. A canvas wall structure as defined in claim 3, wherein said braces 15 comprise a hollow rigid outer shell having said triangular cross-section, and an insulating inner filler within said hollow rigid outer shell.

6. A canvas wall structure as defined in claim 3, wherein said number of braces are arranged in an array of successive horizontally spaced-apart vertical braces linked by horizontal braces to form said brace assembly.

7. A canvas wall structure as defined in claim 6, further comprising a number of additional canvas panels, with each said canvas panel being attached between corresponding bordering horizontal and vertical braces.

8. A canvas wall structure as defined in claim 7, further comprising brackets for fixedly attaching said brace assembly to the wall support frame, said brackets supporting corresponding ones of said horizontal and vertical braces.
9. A canvas wall structure as defined in claim 8, wherein said brace assembly comprises attachment members allowing some of said braces to be attached to other corresponding braces.

10. A canvas wall structure as defined in claim 4, wherein said attachment joints each comprise a bolt threadingly engaging said third brace wall of a corresponding said brace, said bolt having a head portion protruding away from said third brace wall, and said canvas panel comprising a peripheral lip portion which has holes that are larger than said bolt heads, said attachment joints each further comprising a yieldingly deformable washer having an inner hole that is engageable by said bolt and that is smaller than said bolt head, and an outer diameter that is larger than said holes in said canvas panel peripheral lip portion, said bolt engaging both said washer and said canvas panel holes to attach said canvas panel lip portion to said third brace wall, said yieldingly deformable washers defining said yielding resistance threshold by being capable of deformably releasing said bolt heads upon an explosion blast impinging on said canvas panel with sufficient force.

11. An explosion-safe wall comprising a canvas wall structure and a wall support frame destined to be fixedly anchored to the ground, said canvas wall structure defining opposite first and second sides facing in respective opposite first and second tangential directions and comprising:

   a brace assembly comprising a number of braces each having a convex brace wall oriented towards said first tangential direction;
   
   brackets fixedly attaching said brace assembly to said wall support frame;
   
   at least one canvas panel; and
   
   a number of yieldingly releasable attachment joints releasably attaching said at least one canvas panel to corresponding said braces, said attachment joints defining a yielding resistance threshold;

   wherein upon a blast impinging on said at least one canvas panel towards said second tangential direction with sufficient force to overcome said yielding resistance threshold of said attachment joints, said attachment joints will yieldingly release said canvas panels from said corresponding braces, with said convex brace walls oriented towards said first tangential direction providing an aerodynamic shape that will deflect the blast to help prevent the blast from blowing said braces away.

12. An explosion-safe wall as defined in claim 11, wherein said braces comprise a leading edge oriented towards said first tangential direction and inclined brace walls receding from said leading edge towards said second tangential direction, said leading edge and receding brace walls forming said convex brace wall.

13. An explosion-safe wall as defined in claim 12, wherein said braces each have a triangular cross-section with said leading edge corresponding to one edge of said triangular cross-section and with said receding brace walls corresponding to first and second flat brace walls converging towards and linked at said leading edge.

14. An explosion-safe wall as defined in claim 13, wherein said braces each define a third flat brace wall linking said first and second brace walls and facing towards said second tangential direction, with said at least one canvas panel being attached to said third flat brace walls with said releasable attachment joints.

15. An explosion-safe wall as defined in claim 13, wherein said braces comprise a hollow rigid outer shell having said triangular cross-section, and an insulating inner filler within said hollow rigid outer shell.

16. An explosion-safe wall as defined in claim 13, wherein said number of braces are arranged in an array of successive horizontally spaced-apart vertical braces linked by horizontal braces to form said brace assembly.

17. An explosion-safe wall as defined in claim 16, further comprising a number of additional canvas panels, with each said canvas panel being attached between corresponding bordering horizontal and vertical braces.

18. An explosion-safe wall as defined in claim 17, wherein said brace assembly comprises attachment members allowing some of said braces to be attached to other corresponding braces.

19. An explosion-safe wall as defined in claim 18, wherein said wall support frame comprises upright ground-engaging posts and wherein a number of said vertical braces are installed along said posts and are attached thereto with said brackets.

20. An explosion-safe wall as defined in claim 14, wherein said attachment joints each comprise a bolt threadingly engaging said third brace wall of a corresponding said brace, said bolt having a head portion protruding away from said second brace wall, and said canvas panel comprising a peripheral lip portion which has holes that are larger than said bolt heads, said attachment joints each further comprising a yieldingly deformable washer having an inner hole that is engageable by said bolt and that is smaller than said bolt head, and an outer diameter that is larger than said holes in said canvas panel peripheral lip portion, said bolt engaging both said washer and said canvas panel holes to attach said canvas panel lip portion to said third brace wall, said yieldingly deformable washers defining said yielding resistance threshold by being capable of deformably releasing said bolt heads upon an explosion blast impinging on said canvas panel with sufficient force.

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