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Leach et al.

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[54] BOMB SUPPRESSION DEVICE

[75] Inventors: **Jack Leach**, Greensboro, N.C.; **Jerome Zoufaly**, Westfield; **William G. Fash**, Jamesburg, both of N.J.

[73] Assignee: **Burlington Industries, Inc.**, Greensboro, N.C.

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[52] **U.S. Cl.** **102/22**

[51] **Int. Cl.** **F42d 5/04**

[58] **Field of Search** ..... 102/22, 23; 89/36 A, 36 D, 89/36 F

[56] **References Cited**

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3,371,604	3/1968	Wikner et al.	102/22
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Primary Examiner—Verlin R. Pendegrass

Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

A bomb suppression device for use in shielding an explosion of a small explosive device such as a pipe bomb. The suppression device has upper and lower blankets held together by flexible straps. The flaps attached to the upper blanket extend down towards the lower blanket when the device is in an expanded position. The bottom blanket has a central opening which acts as a flue for the gases released by the bomb, directing the gases upwardly and causing the device to expand in a balloon-like manner. The straps attaching the upper blanket to the bottom blanket are long enough to provide a gap between the lower edge of the flaps and the edges of the bottom blanket to allow the escape of gases generated by an explosion. A standoff device is utilized which is first placed over the bomb so that the blanket members may be positioned without making contact with the bomb.

6 Claims, 4 Drawing Figures

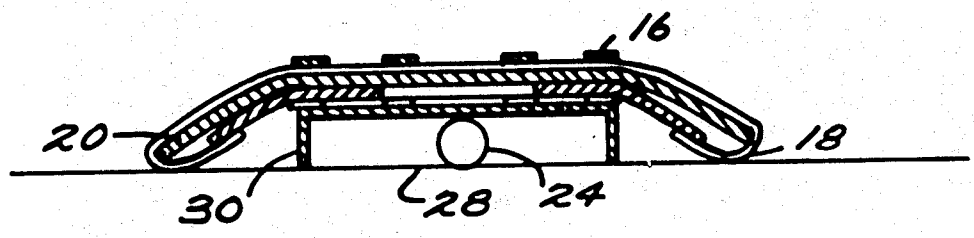


Fig. 1.

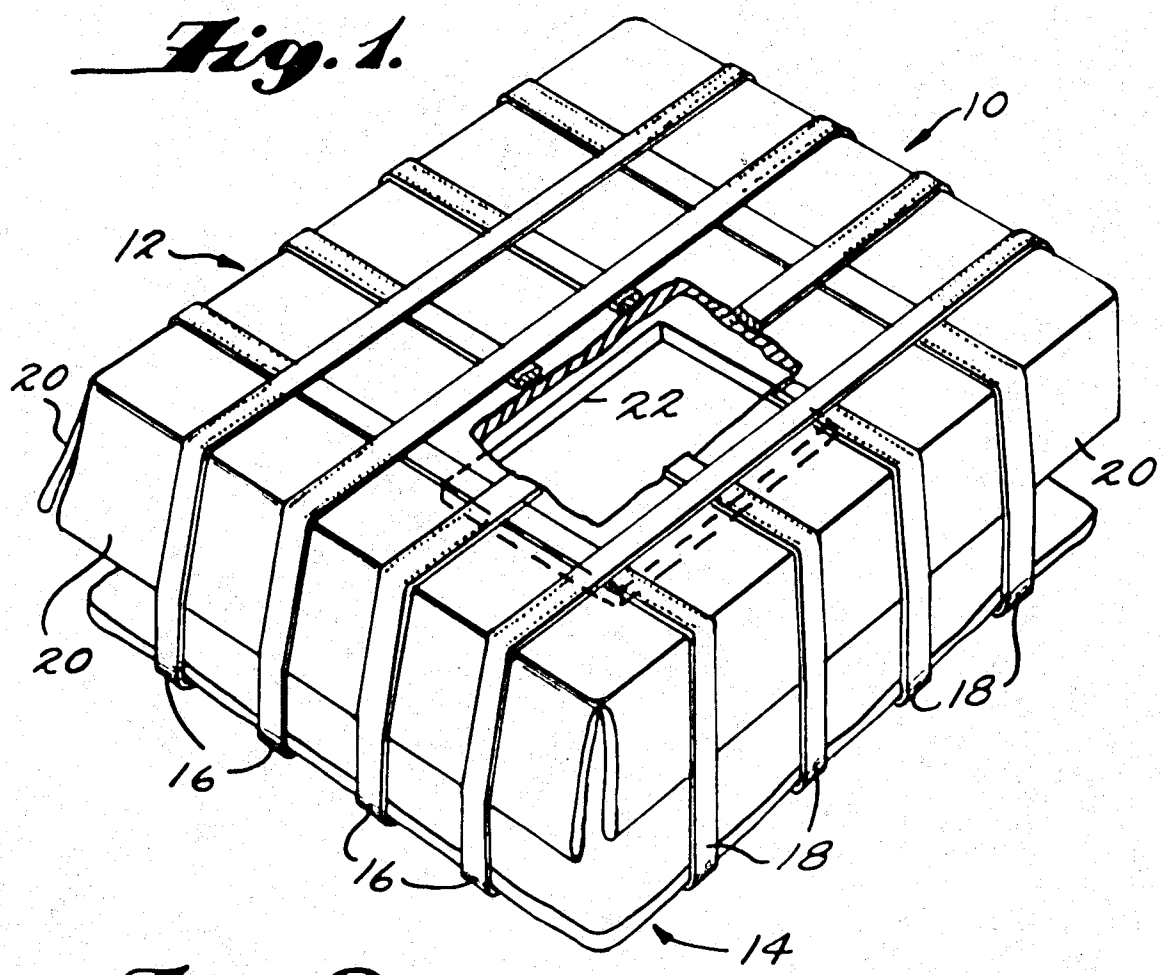


Fig. 2.

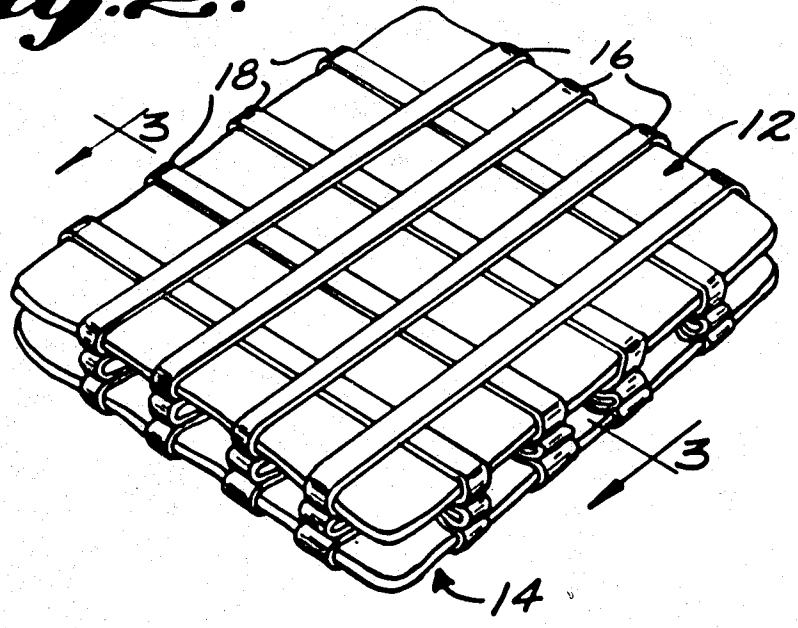


Fig. 3.

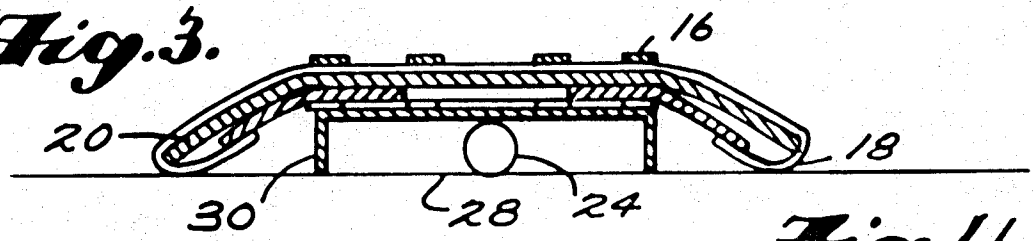
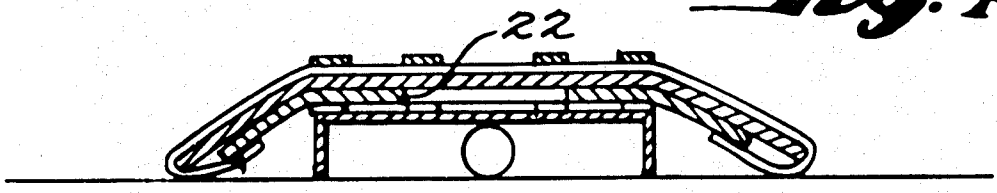
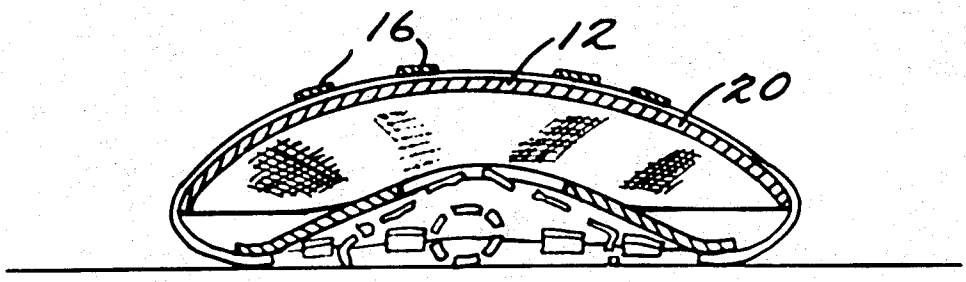
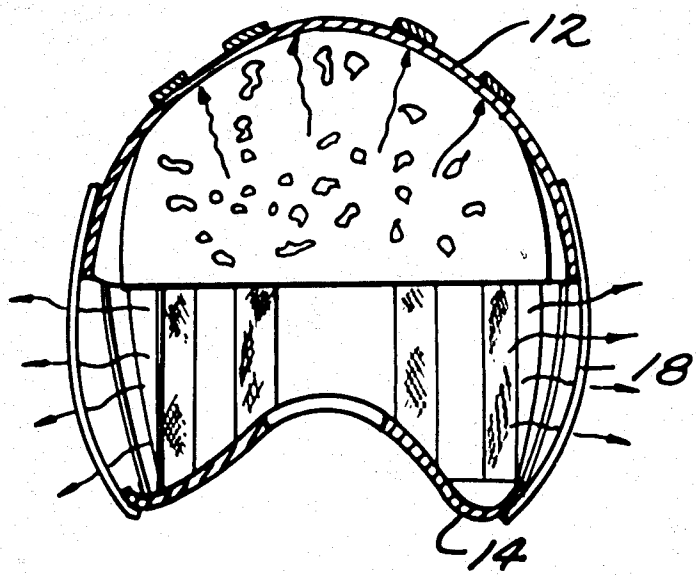


Fig. 4







BOMB SUPPRESSION DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an improved blanket-type bomb suppression device for reducing the blast effects of an explosive device and for catching and containing the fragments or shrapnel of the exploding bomb.

2. Prior Art

Many blanket-type devices have been designed to be utilized in the excavating industry for minimizing possible harmful effects to people and property caused by dynamiting operations and the resultant flying of small solid pieces, such as rock fragments, at high velocity. These devices, however, are fairly large and cumbersome and cannot be easily handled or utilized where relatively small explosive devices are to be contained. One of the major areas in which these previously described devices are not useful, is in police or military applications where there is a need for easily transportable devices that can be used quickly and in confined areas to protect against small bombs, especially, but not exclusively, those made with low velocity explosives. Low velocity explosives are in general of the smokeless powder type relatively readily available to the public. Blanket-type blast suppression devices are ineffective against larger bombs made with high velocity explosives, such as dynamite, TNT, etc.

Only recently have devices been developed which may be utilized in police or similar work where small bombs or explosive devices are encountered in public areas. One such device is disclosed by U.S. Pat. No. 3,648,613. It is the general purpose of such devices to provide protection from the harmful effects of an explosive device by covering the device to suppress the blast and prevent bomb fragments, i.e., shrapnel, from being thrown into the surrounding area. The means generally employed to accomplish this purpose is a blanket of adequately large dimension which is supposed to encompass the explosion by being lifted off the ground by the gases released by the explosion as the casing fragments of the explosive device move upward. The edge portions of the blanket are intended to drag behind to form a canopy which, hopefully, will suppress the blast and contain the shrapnel being propelled by the explosive gases.

One of the major disadvantages of such a blanket is the fact that in an explosion caused by the type of explosive devices herein being considered, i.e., a small bomb, and for that matter any explosion, the released gases move at a much higher velocity than the bomb fragments and cause a shock wave. This shock wave strikes the blanket first and usually blows it away before it is reached by the shrapnel. Thus, the usual bomb blanket is relatively ineffective to trap and contain bomb fragments.

SUMMARY OF THE INVENTION

The present invention overcomes the above-described deficiencies by providing an improved blanket-type bomb suppression device which is not blown away from an explosion by the initial shock wave of an explosive blast and thus remains to encompass and trap the major portion of the shrapnel caused by such an explosion. In addition to this advantage, the bomb suppression device disclosed herein also directs the movement of a large portion of the gases upwardly, thus substantially reducing the harmful effects of the explosion in the lateral direction.

The device includes top and bottom blankets preferably made of ballistic cloth. The top blanket has flaps sewn around the peripheral edges, which hang downwardly in a spaced relation to the peripheral edges of the bottom blanket when the device is in an extended position. The bottom blanket has a central opening therein which is capable of acting as a flue for the gases and shrapnel released by the explosion of a bomb. The top and bottom blankets are secured together by flexible straps made of a fairly strong material such as nylon and which are of adequate length to allow a separation between the bottom edges of the flap and the peripheral edges of the bottom blanket when the bomb suppression device is in an extended position as a result of the explosion.

In addition to the blanket members, a standoff device is provided which is first placed over the explosive device prior to the blankets being disposed on top thereof. The standoff device is preferably made of a non-shrapnel producing material such as cardboard, styrofoam, etc. The shape of the standoff device is essentially that of an inverted box which can be placed over the explosive device leaving a space between the sides and top of the explosive device and the internal surfaces of the standoff device. It is to be understood that any shape which provides the standoff capability, i.e., keeps both the standoff device and the bomb blanket positioned on top thereof from touching the bomb, is acceptable as a standoff device so long as it also has the other qualities mentioned above.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a partially expanded blanket-type bomb suppression device illustrating an embodiment of the present invention, with part of the upper blanket cut away to show the opening in the bottom blanket.

FIG. 2 is a perspective view of the bomb suppression device of the present invention shown in FIG. 1, in a collapsed position.

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2.

FIG. 4 is a diagrammatic cross-sectional view showing successive configurations of the device shown in FIG. 1, when utilized to cover an exploding bomb.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, the bomb suppression device 10 includes generally coextensive top and bottom blankets 12 and 14, preferably made of ballistic cloth connected together by lengths of strapping 16 and 18 sewn or otherwise connected to the blankets. As shown, both blankets 12 and 14 are generally square, but it will be realized that other configurations, e.g., circular, will be effective. Preferably the top blanket has edge flaps 20 either integral therewith or sewn, or otherwise, attached thereto. As shown in FIG. 1, the straps 16 and 18 limit the vertical separation possible between the top and bottom blankets 12 and 14, but are long enough to provide a peripheral gap or opening between the lower edges of the depending flaps 20 and the bottom blanket 14. For added strength, the straps 16 and 18 desirably are formed of lengths of strapping which extend completely across the top blanket 12 and

extend inwardly beneath the lower blanket 14 for an extended distance and are securely sewn along a major portion of their coextending length to both the top and bottom blankets.

The bottom blanket 14 has a central opening 22 of suitable configuration and dimensions to allow a large portion of the gases produced by an exploding bomb to pass therethrough with little or no hindrance. The device of this invention is particularly useful in protecting against the blast and flying shrapnel of an exploding pipe bomb. These are usually short pieces of iron or steel pipe filled with a low velocity explosive powder and having end caps secured thereto. One of the caps usually has a small hole in it for receiving a fuse.

In FIG. 2, the blanket-type bomb suppression device 10 (without the standoff device 26) is shown in a folded position with the flaps 20 and straps 16 and 18 folded between top and bottom blankets 12 and 14 for ease in handling and storage of the device.

In FIG. 3, the device of the present invention is shown in position over a bomb 24. Additionally, a standoff device 26 is provided which has an open bottom, sides 28 and 30 and top 32. The standoff device 26 can be of any configuration so long as it is structurally strong enough to provide support for the bomb suppression device 10 and its sides extend high enough to prevent contact with the bomb 24. In achieving the position of FIG. 3, the standoff device 26 is first placed over the bomb 24, the flaps 20 and straps 16 and 18 of the bomb suppression device 10 are preferably extended or unfolded from between the top and bottom blankets 12 and 14 before the bomb suppression device is positioned on top of the standoff device. The standoff device 26 thus prevents any actual contact with the bomb 24. This is important since many bombs are made so that they will detonate if touched or disturbed in any manner.

FIG. 4 shows the successive positions assumed by bomb suppression device 10 following the detonation of pipe bomb 24 therebeneath. FIG. 4*a* shows the initial position in which standoff device 26 is to be placed over bomb 24 with the latter centered in the opening in the standoff device. Bomb suppression device 10 is then placed over standoff device 26 in the manner described above.

Shortly after the detonation of the bomb 24, its casing shatters and releases outwardly rushing expanding gases as shown in FIG. 4*b* which initially shatter standoff device 26 and push upwardly against bottom blanket 14 as well as downwardly against the surface on which the bomb is setting. Because of the large central opening 22 in the center of bottom blanket 14 the gases rush upwardly since this is the path of least resistance. Opening 22 thus acts as a flue directing gases up into bomb suppression device 10.

As the explosion progresses, the gases push upwardly against top blanket 12 causing it to separate from bottom blanket 14. The separation is limited by straps 16 and 18 which become fully extended. Flaps 20 are confined by straps 16 and 18 causing them to extend downwardly toward bottom blanket 14. Due to the length of straps 16 and 18 a gap is left between flaps 20 and bottom blanket 14 which allows a substantial amount of gas to escape therethrough. This delays the lifting of top blanket 14 and thus the whole bomb suppression device 10. As a result of this delay, the shrapnel produced by the bomb casing, which is moving mostly upwardly as a result of the movement of the gases in that direction, is caught by both upper and lower blankets 12 and 14.

The material from which the bomb blanket 10 of this invention should preferably be manufactured, consists of multiple layers of flexible material such as, but not limited to, a woven nylon cloth commonly referred to as ballistic fabric. These layers should be stitched together by a series of closely spaced stitching either parallel, concentric circles, diamond shapes, etc., in order to present a unified construction. The flexible material can be formed from materials commonly used which would provide the proper mass and strength requirements. Such a material can be produced from a fabric weighing approximately 8 ounces per square yard woven from 840 denier nylon as is produced by several textile fiber manufacturers. Such a fabric after proper scouring and drying should have a nominal construction of 32 ends per square inch and 32 picks per square inch and a ballistic V-50 rating of approximately 1275 to 1375 feet per second when tested in accordance with the procedure outlined in military specification MIL-C-12369E of the U. S. Department of Defense. Another example of a fabric which can be used to produce the bomb blanket of this invention is a 14 ounce per square yard fabric woven of 1050 denier nylon of suitable commercially available nylon as mentioned above. This fabric must be properly finished, i.e. fully scoured and dried also as previously mentioned, resulting in a fabric which would meet the military standard specifications mentioned, of a V-50 rating of 1,275 to 1,375 feet per second. While these are the most acceptable textile materials currently available, this does not preclude the use of other fabrics made from such aromatic polyamides as fiber B or PRD-49 as manufactured by E. I. DuPont de Nemours in appropriate fabric construction from appropriate deniers. Nor should the use of other materials such as finely woven stainless steel mesh, glass fiber fabrics or ceramic materials alone or in combination with stranded nylon ballistic fabric, be considered outside the scope of this invention. Considerations of weight, portability, flexibility and necessary protection dictate the portions of these materials to be used in combination with ballistic nylon or other materials, or alone. In addition, the invention as described herein should not be taken to exclude the possible use of needle punched felts, conventional warp or circular knit fabrics or stabilized stitch knits in the production of such blankets.

The material used in the straps can be of a suitable woven nylon such as used in automobile seat belts; however, other materials which are flexible and supply the required strength, could also be used.

As an example of an embodiment of the invention, the layers of cloth are made from 840 denier nylon meeting the standards set forth in MIL-C-12369E mentioned above. The top blanket 12 has 24 layers, is 48 inches square and the flaps 20 are 12 inches wide extending the full length of each side. The bottom blanket 14 has 18 layers, is 48 inches square and has central opening 22, 14 inches square. The layers are sewn together utilizing one of the above-mentioned stitches to provide a unified construction. The standoff device is essentially an inverted cardboard box 14 inches by 20 inches by 6 inches. Nylon strapping of the type utilized for seat belts was used to make straps 16 and 18. Adequate length of strapping is utilized to allow a gap of ap-

proximately 1 foot between flaps 20 and bottom blanket 14 when bomb suppression device 10 is in an extended position. This example was developed as a result of use of a range of explosive devices which are believed to be of the type commonly encountered by police bomb squads and the like and for whose intended use this device was invented. The dimensions of the blankets 12 and 14 will be dependent to some extent on the width or dimensions of the central opening 22 since adequate material must be supplied to provide the enveloping effect previously described as a bomb is exploded thereunder. Other considerations when establishing the size of the device are the weight of the blankets and if the dimensions become too large the device will tend to be cumbersome and unwieldy to handle, which can be an important consideration since such devices might well be used in confined spaces in which there is little light except that presented from hand-held flashlights, thus presenting a handling problem.

Also it has been discovered that if the number of layers of fabric used to construct the top and bottom blanket is appreciably increased so as to substantially increase the weight of the blanket, the efficiency of the bomb suppression device is decreased since the gases will tend to find a path of lesser resistance, i.e., out from under the sides of the bottom blanket.

The design of flaps 20 and the gap between the flaps and bottom blanket 14 should be such that will allow a substantial amount of gases to escape, thus retarding the movement of the bomb suppression device upwards until the shrapnel is captured therein, and yet should not provide a gap so wide that a large amount of shrapnel will escape therethrough.

Other considerations regarding the material from which the devices are to be manufactured are in the color or dyed fabric to be used for the outer layer of the blankets. This outer layer or covering is intended to provide a distinctive appearance and can be manufactured from either a polyester/cotton blend fabric or nylon dyed to appropriate shades for high visibility such as international orange, canary yellow or possibly a fluorescent lime green. The purpose being to provide a highly visible object when the device is being used to cover a bomb and also to provide a means for easily locating the device and identifying it as such, when it is needed.

Some of the advantages which are readily perceivable from the description are that the device of the present invention is a light weight, easily disposed protective implement for the use of police professional bomb squads, military bomb disposal units, parapolice and security forces, for the protection of banks, office buildings, museums, government buildings, theaters and places of public assembly and similar enclosed area subject to the threat from the effect of clandestinely placed explosive devices. The device can be used to provide protection for property and personnel before the arrival of professional bomb disposal units to dispose of or defuse the offending device and may, thereby contribute to a greater sense of personal safety in the reduction of panic among untrained personnel exposed to the hazard.

In addition to these advantages mentioned, and although the foregoing description illustrates the preferred embodiment of the present invention, it will be apparent to those skilled in the art that further variation is possible. All such variations as would be obvious to those skilled in this art are intended to be included in the scope of this invention.

What is claimed is:

1. A bomb suppression device comprising:
generally coextensive upper and lower blankets;
strap means attached to said upper and lower blankets and extending between peripheral edges thereof for allowing limited separation therebetween;
flap means attached to said peripheral edges of said upper blanket and extendable downwardly therefrom for partially filling a gap produced by said limited separation;
said lower blanket having means defining a central opening therein for acting as a flue to allow gases and shrapnel produced by the explosion of an explosive device positioned thereunder, to flow between said upper and lower blankets so as to produce said separation therebetween.

2. A bomb suppression device as defined in claim 1 and further including:
standoff means for supporting said bomb suppression device in a spaced relation from a bomb in such a manner that neither said bomb suppression device nor said standoff means can touch said bomb.

3. A bomb suppression device as defined in claim 1 wherein said flaps can be folded under said upper blanket when not in use and can fold down to a position relatively perpendicular thereto when said top and bottom blankets are in said spaced relation.

4. A bomb suppression device as defined in claim 1 which is generally rectangular in shape.

5. A bomb suppression device as defined in claim 4 wherein said strap means further comprises:
a first plurality of flexible straps disposed in a spaced relation parallel to parallel edges of said upper blanket and said lower blanket and sewn thereto, and
a second plurality of flexible straps disposed and sewn in a similar manner as said first series but perpendicular thereto.

6. A bomb protective device as defined in claim 1 wherein said upper and lower blankets are made from multiple layers of flexible material which includes:
an outer layer of high visibility material, and
inner layers of ballistic cloth.

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